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Phronesis in Defense Engineering: A Case Study in the Heroic Actions of Two Defence Engineers as they Navigate their Careers

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Phronesis in Defense Engineering: A case Study in the Heroic Actions of Two Defense Engineers as they Navigate their Careers

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We certify that we have read this dissertation and approved it as adequate in scope and quality. We have found that it is complete and satisfactory in all aspects, and that any and all revisions required by the final examination committee have been made.

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ABSTRACT

This case study investigated the experiences of engineers in the U.S. defense industry. The research identified two engineers that demonstrated *phronesis*, or practical wisdom, that sets them apart from their peers. These defense engineers demonstrated exemplary selflessness and ability to navigate the murky moral path while facing personal and professional hardships. In the end, regardless of their right actions and good outcome, they are neither recognized nor rewarded due to various industry and business forces. I call them unsung hero engineers and link their ideas and action to *phronesis*. This study documents their experiences, their ideas, and the outcomes. I also capture the history and current condition of the defense industry and describe the defense engineering work environment. This case study applies various theoretical lenses including Flybjerg's phronesis, Bourdieu's logic of practice, and Goffman's moral career. The result is a rich study in the experiences of defense engineers and how they navigate the defense business, careers, and personal growth.

Keywords: Phronesis, Moral Career, professional reputation, *Habitus*, total institution, defense engineer.

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INTRODUCTION

My name is Chandrakant Madhav. I am a senior project engineer for a major defense contractor named ACME (a pseudonym) located in North City (a pseudonym) in the Midwest region of U.S.A. I have over 30 years of work experience with increasing responsibility in the industry and the last 22 years with ACME North (a pseudonym). My career with ACME North is very fulfilling and exciting with numerous opportunities to participate in cutting-edge engineering. This business unit of ACME, with its 500 employees, has provided me numerous opportunities to transition between engineering and management. As a member of the management team, I have gained many administration, organization, and management skills. However, I prefer engineering work and get considerable personal fulfillment from product design and development. I am presently on the engineering side of the business as an Integrated Product Team (IPT) Lead Systems Engineer for a medium-sized program.

The best parts of engineering are the technical and organizational challenges. I love solving all kinds of problems. I often take on festering issues that are ignored or are deemed unsolvable by others. I have had many successes at conducting both technical and management investigations. Some of my investigations and product development activities have led to additional new business for ACME North.

This study was originally about the on-going relationship between two business units of ACME. However, the data revealed two engineers with exceptional ability contribute to the well-being of others in the system and thereby transcending their scientific backgrounds and training. This is a *phronetic* analysis of these two engineers that navigate the field and *habitus* of their chosen careers. Simply, *phronesis* is the application of moral wisdom and the analysis of value with power. I further explain *phronesis* and *habitus* in Chapter 1.

I call them “hero engineers” and will document how they navigate the system, encounter hardship, overcome obstacles, and forge creative solutions to improve the human-condition of their fellow engineers regardless of recognition and rewards. They are unsung heroes. To provide context, I will also describe the history and the environmental condition that supports the rise of these hero engineers.

Before I describe the topic, I will provide some background. ACME, like most defense companies in the last 30 years, has undergone significant consolidation due to reduced defense funding. One such consolidation was the 1995 acquisition of a Navy base located in South City (a pseudonym) of South State (a pseudonym). This purchase was part of a negotiated deal between ACME and the U.S. government during a time when defense reductions were being implemented through Navy base consolidations and closures. The deal required Congressional support and was facilitated by South State’s senior senator who is a long-standing member of the Senate Appropriations Committee, the umbrella for defense appropriation. These sister business units, ACME North and ACME South (a pseudonym), though intricately linked and symbiotic, seem to have a discordant relationship. Management has tried various ways to improve this relationship between the two business units without success.

I have been aware of this dysfunction between the two business units for a long time and have personally experienced the negative consequences of this clash. Over time, this relationship has worsened. The causes for these hostilities are complex, but I believe that changing from being competitors to sister business units through mergers and acquisitions, inadequate leadership, and insufficient time to adjust to one another may be contributing factors.

These acrimonious relationships are not uncommon in defense industry corporations and are possibly the result of corporate changes brought about by industry instability. A lot of

what is happening between the two ACME two business units is an indicator for the rest of the industry. When collaborating with other on projects, I have personally experienced similar business relationship issues at other corporations where sister business units seem to also have contentious relationships. This case study also provides a glimpse in the inner-workings of a typical defense engineering company.

It is with this relationship as the background that I capture the actions and experiences of two hero engineers. These heroes take it upon themselves to improve the relationship between the two divisions. I have known one of them for over 22 years and had numerous interactions prior to and during this study. The other I had known only through reputation prior to this study. This was a multidimensional study of these individuals using two projects and the relationship between the business units as background. I was not directly involved in these projects but was privy to all that was going on in my position as a manager and project engineer.

This research also provided a glimpse into the work of a defense engineer, how work is accomplished in the industry, and the relationship between defense businesses and government. This study provides some insight into the defense industry; an oft misaligned and misunderstood but politically-powerful industry.

There are many quantitative studies on the industry by private and government organizations but few that provide information on these kinds of relationship issues. There are also few holistic views of the industry and even fewer studies on defense engineers. Qualitative analyses of the industry are rare and a neglected part of the contemporary defense industry. I hope to share my insider experience that has provided a unique understanding of the industry. I hope this study influences the debate on national defense and defense expenditure.

CHAPTER 1: LITERATURE REVIEW

> Where science does not reach, art, literature, and narrative often help us comprehend the reality in which we live.
>
> - Bent Flyvbjerg (2008)

Section 1: Relevant Topical Literature

This section begins with the history of the defense industry and how the industry came about in the 1950s. I will present the history of defense spending and evaluate the impact of downsizing on defense contractors, soldiers, and defense industry employees. The defense business is a complex, specialized field, with many players and participants.

History of the Military Industrial Complex

From the War of 1812 to World War II, government military arsenals produced almost all of the weapons and ordnance used by the U.S. armed forces. This setup was fine until the capabilities of these arsenals were deemed limited during the massive arms buildup during World War II. The government had no choice but to solicit the private industry to help meet the war's demands for massive quantities of military equipment. To meet this demand, the bulk of the US weapon production shifted to private, for-profit companies (Watts & Harrison, 2011).

At the end of World War II, the U.S. government held title to a significant portion of the country's industrial base including 90% of the synthetic rubber, aircraft, and magnesium industries and over 50% of the aluminum and machine tool industries (Kapstein, 1993). These assets needed to be transferred to the private sector through a process of conversion. Some were easy to convert; others were a downright failure leading to the dumping of billions of dollars' worth of machine tools in the ocean and rebuilding the economy anew (Minnich, 1993).

After WWII, two significant events brought about the permanency of the military industrial complex. The first event was the Southeast Asia conflicts of Korea and Vietnam that

further demanded continued support from for-profit defense activities. The second event was the start of the Cold War (Watts, 2008). By the mid-1950s, the defense industrial complex had become a permanent part of our economy.

Over time, more and more of the production of weapons was transferred to the private sector. This process continues today with outright base closures or transfer of assets to for-profit corporations. There are many reasons why government arsenals were ill-equipped to serve the needs of our nation. The weapons were becoming more complex requiring large-scale collaboration between science, technology, and manufacturing. These were easily supplied by the various private engineering firms, universities and production companies. This was also the onset of the Cold War and nuclear arms were the dominant weapon of development and production. The arsenals were also very slow to respond to the changing environment and hubris from their previous monopoly had led to significant inefficiencies. The shift from arsenals to private defense, or the policy of economic conversion, helped solidify defense contracting. A peacetime defense industry had become a permanent feature of the U.S. economy continuing even after the collapse of the Soviet Union (Watts & Harrison, 2011).

President Dwight Eisenhower, during his farewell address to the nation on January 18, 1961, called attention to the "conjunction of an immense military establishment and a large arms industry." And warned that "in the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist" (Eisenhower, 1961).

Contemporary Industry Description

The U.S. defense industry is a significant factor in the American economy and in the nation's strategic posture. The industry is funded by Congress through the Pentagon. The Pentagon is responsible for coordinating and managing all the various branches of the armed forces including defense acquisition.

In 2012, the Pentagon obligated approximately $360 Billion for goods and services including major weapon systems, information technology, professional and administrative support, weapons systems and base maintenance, and office supplies. Of this, approximately 70% went to the development and production of weapon systems (GAO Report, 2013). This industry employs about one-third of all American scientists, one-fifth of all engineers, and close to one-tenth of the manufacturing labor force (Gansler, 1986). In the next section, I will describe the industry and various strategies available for contracting with defense companies.

Industry makeup. So far we have considered defense contractors as a cohesive and influential group. However, the industry is not a homogeneous group and is made up of various sectors. To best describe the industry, I will consider them segregated into prime contractors, second tier, and small suppliers. The top ten "primes" or giants of the industry have recently been Lockheed Martin, Boeing, ACME (USA), General Dynamics, Raytheon, Northrup Grumman, L-3 Communications, United Technologies, SAIC, and Huntington Ingalls Shipyard. These giants took in close to a third of all Pentagon allocations with the rest going to wars, soldiers and civilian personnel salaries, office and computer supplies, pensions, and soldier/veteran health care. These primes are paid to not only develop, integrate, and deliver the product but also to manage and coordinate subcontractors and suppliers. They have tremendous capabilities in labor, facilities, and know-how to bring complex weapons to market. These

primes have total control of the market, and the Pentagon does not bypass them for any large contracts. Most are specialized in their area of expertise, and they ferociously guard their turf. They have multiple business units and - except for Boeing which has both commercial and military products - defense is their only business focus. These primes rarely compete with each other for contracts and more often collaborate through agreements, work-share, and joint partnerships. They also have a significant lobbying presence in Washington D.C. at corporate and industry levels. All have retired military leaders working for them or on their boards of control.

The second tier is made up of major corporations that provide specialized products and materials used by the giants in the development of weapon systems. These are computer, services, and technology providers such as high-tech engineering tools and specialized high-reliability electronics and software. These second tier companies usually provide services and equipment to the primes. There is some competition within the second tier. The primes manage these subcontractors with tough negotiations and fixed price contracts. Often, these companies have a combined defense and commercial application. There is some volatility in the fortunes of these companies since there is an ongoing leap-frogging for new technologies and newer materials.

The lowest tier, also the least powerful group in the industry, is made up of small companies that provide parts and equipment for both commercial and military needs. They deal with fixed price contracts with the primes and second tiers and are in a highly competitive and volatile market. The primes and subcontractors often flow down contractual language from Pentagon making it more expensive to manage and difficult to make a profit. There are many small firms that compete for this business and they provide cheaper, mass-produced products and

services. They have to satisfy accounting, safety, and quality audits in order to become an approved supplier; however, becoming an approved supplier does not guarantee work (Gansler, 1986). Though there are "small-business" clauses in defense contracts that are intended to direct work to small and disadvantaged businesses, these clauses are usually poorly written and rarely enforced. The prime contractors have also developed various ways to bypass these clauses by linking them to cost increase, poor quality, and schedule delays. A summary of the various differences between the various sectors is provided in Table 1 (see Table 1). This table, constructed from my personal experience in the defense industry and Ganlser (1986), also includes government owned military arsenals as a sector to comprehensively show disparity in the defense industry (Watts & Harrison, 2011).

Purchase and Acquisition Strategies

The Pentagon has two methods of purchasing services and weapons from contractors. The Level of Effort (LOE) method is where Pentagon pays all the accrued development and production costs through full labor, services, and material cost reimbursement contracts. LOE, also called cost-plus contract, allows the contractor to charge the total cost of parts and labor, and a pre-agreed profit percentage. In some cases, there is an incentive bonus (called award fee) that is also given to the contractor based on meeting cost, quality, and schedule targets. The alternate is called the fixed-price contract. This method forces the contractor to set a ceiling price for the product/ services and costs above and beyond the ceiling would be contractor responsibility. Though this may seem like a benefit for the Pentagon, most contractors estimate a higher ceiling price to ensure profit even in the worst of conditions. Neither of these two methods is a cost saver for the tax payer (Harrison, 2012b).

Table 1. Defense Industry Sector Comparison **(*** Original analysis as informed by Gansler (1986)**)***

Characteristic	Military Arsenal	Prime(s)	Medium Tier	Low Tier
High-Tech	Low	High	High	High-Med
Profit Margins	N/A – Not a profit making enterprise	High	Med	Low
Contract Type (Typical)	Full funding for personnel and equipment	Level of Effort (LOE)	Fixed Price	Fixed Price
Efficiency	Low	Med	High	High
Business Capability	Few low-tech products	Few high-tech, complex products	Technology to support multiple industries	Technology or manpower to support multiple industries
Private/Govt Owned	Govt owned	Private	Private	Private
Overhead Cost	High	Med	Low	Low
Typical Company/Org	Rock Island Arsenal, Redstone Arsenal	Lockheed Martin, Raytheon, Boeing, ACME	Kaman Aircraft, Motorola, Teledyne	Circuit card makers, machine ships, assembly houses
Market Type	Closed	Closed	Mainly Closed	Open

Competition Structuring

The Acquisition Reform Act of 2009 requires the department of Defense (DoD) to use acquisition strategies that "ensure competition or the option for competition, at both the prime contract level and subcontract level". The law goes on to identify competitive prototyping and dual or multi sourcing as measures to ensure competition (Harrison, 2012b). Increasing competition may actually increase the overall cost because Pentagon would have to fund multiple contractors for design, development, and/or production. And, the fewer number of items produced by each contractor would not provide cost benefits.

To satisfy proponents of competition, the Pentagon attempted to create competition by two main means: Multi-sourcing development and then "down-selecting" (or awarding the contract) to a single producer; or single sourcing the development and then getting multiple producers. Down-select is the process of evaluating multiple developers and awarding the production contract to only one of them. Neither multi-sourcing nor single-sourcing are perfect means of buying weapons. Multi-sourcing requires two or more contractors to work on the same weapon to create an opportunity for competition. In these cases, the Pentagon must pay (directly or indirectly) for two or more contractors to develop the same system. This redundant work adds to the overall program cost.

Similarly, if the Pentagon were to down-select to the best production contractor after multiple development contractors, this would effectively end competition and grant the winner a monopoly for future procurements of the same system. On the other hand, if there was one development contractor and multiple production contractors (a "build to print" approach), the Pentagon must still pay for the development of more than one production line (Harrison, 2012b). Either way, the Pentagon does not win.

Mergers, Consolidations and Takeovers

The defense business is a cyclical market and defense contractors (should) have the means to adjust to changing environment (Udis, 1993). In times of funding increase, they take on employees and easily shed them during tightening markets. Over time, these ups and downs have shown to be predictable with cycle time of about 20 years (about 10 years up, 10 years down) or "long wave" patterns (Kapstein, 1993). In order to adjust to these cycles, defense contractors buy and sell businesses, start new businesses, consolidate, shut-down, and merge with other defense contractors as tactics to remain viable and profitable.

The best way to reduce competition in the industry is to buy out the competition, combine this acquisition with existing business and then shed any redundancies. During industry downturns, these buying and selling are even more prevalent since many corporations are looking to consolidate, sell-off redundancies, and find opportunities that other defense contractors may want to shed. Unfortunately, the brunt of the downturns and industry reconstitutions are usually felt by the workers due to reduced wages, pressures to increase productivity, unpredictable futures, increased worker to worker competitions, and cycles of layoffs.

The present defense industry has become very streamlined, and as a result maintains only minimal physical capital, human skills, manufacturing, and research organizations needed to produce new weapons. This continued industry reconstitution implies that long-term plans (greater than 10 to 20 years) become redundant since contractor capabilities may not be available when desired (Blair, 1993) and corporations are not willing to hold on capabilities that are not currently producing income.

Defense Spending

Defense spending is an ongoing debate in our society. Some feel it is taking up too much of our federal budget whereas others ask for more to be spent in this area. The numbers support both sides depending on evidence used. Tracking the year-to-year spending, one would see increases due to adjustments for inflation. On the other hand, tracking spending as a percent of Gross National Product (GDP) shows the spending peak in World War II at 6.3% of GDP and post-Sequestration spending at less than 4% (Harrison, 2011).

U.S. military services and the defense industry have undergone major changes since World War II (Watts, 2008) and have experienced four major cycles of rise and fall in budget

allocations to defense. These four cycles are the Korean War, the Vietnam War, the Reagan Buildup, and Homeland Security. Homeland Security also includes the ongoing wars in Iraq and Afghanistan.

The overall defense budget as well as the allocation to various components of the budget over the last half of the twentieth century and the beginning of the twenty-first is shown in Figure 1 (see figure 1). Of particular interest is the approximate 30% reduction in appropriations funding after the Reagan buildup in the mid-1980s. This significant reduction led to additional Navy base consolidations and closures and the privatization of a Navy arsenal which is now ACME South.

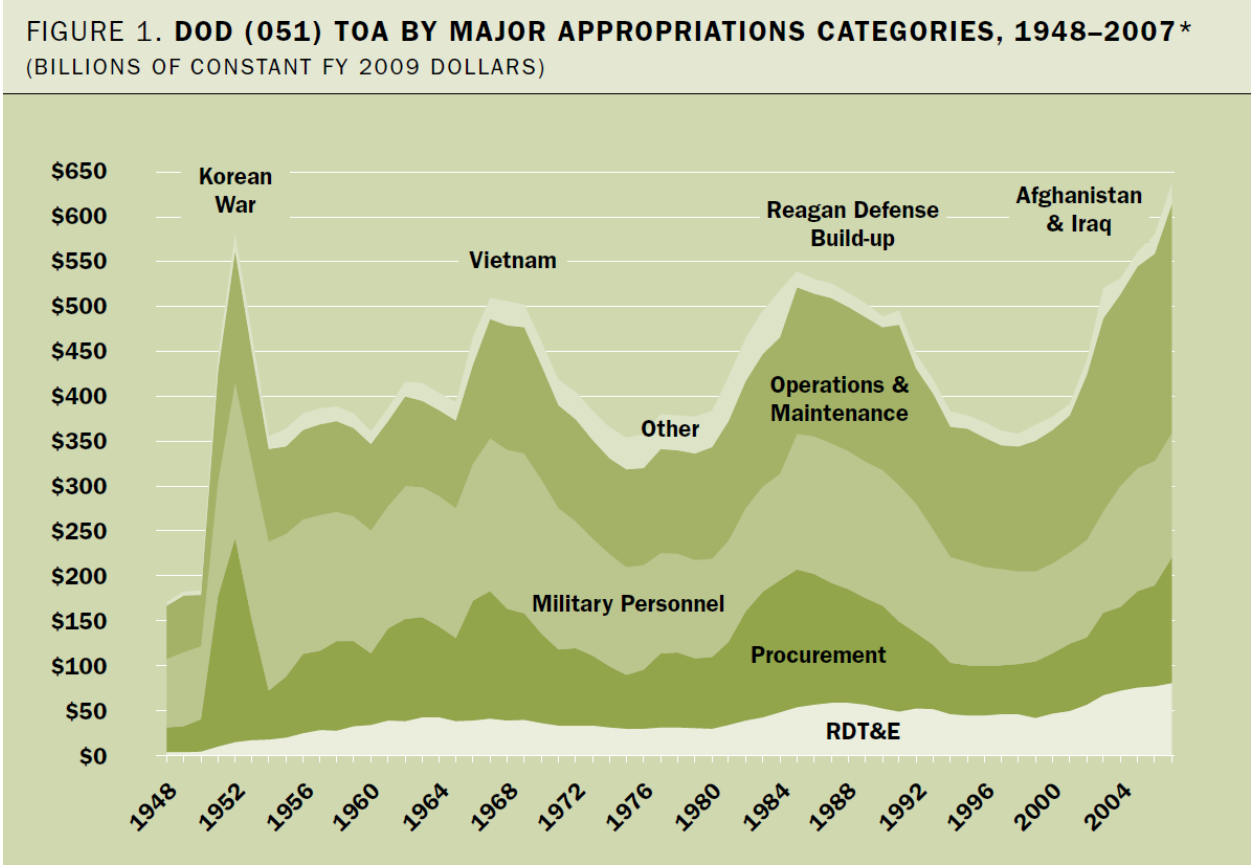

Figure 1. Defense Department Total Obligational Authority (TOA)
(In constant FY2009 dollars (Watts, 2008))

This chart provides details up to 2004. After that, the overall budget continuously rose only to come to a downturn in January 2013 due to automatic budget cuts (not shown). These cuts were commonly called Sequestration. At peak, the 2012 defense budget (including the two war allocations) came to approximately $703B (Harrison, 2011) including a base budget of $553B. In 2013, due to Sequestration, the base budget was cut by 10.3% (or $54B) leading to the overall budget of approximately $570B. For follow-on years and as of the period of this research, Sequestration is expected to produce an annual reduction of $54B. This implies that defense budgets are in decline for the foreseeable future.

Of particular interest to this study is the post-Reagan Defense downturn that occurred between 1992 and 2002. In 1995 the U.S. Navy base located in South City was privatized by the U.S. Navy with Congressional support. This privatization led to the purchase by ACME. This case study concerns this era's implications as played out at ACME. In the next section, I will further discuss the funding environment that covers the era between 2004 and present.

Impact on Defense Contractors, Soldiers, and Defense Workers

According to Harrison (2012a), military personnel and procurement took the largest cuts in 2013. The majority of these procurement dollars are usually allocated to defense contractors for ongoing product development and purchase of new weapons. As of 2013, the winding down of military actions in Iraq and Afghanistan was expected to add additional pressures for further reductions. These cuts have significantly impacted defense companies and have led to plant closures, consolidations, and layoffs. In previous defense down-turns, the rest of the economy was on the upswing and easily absorbed unemployed soldiers and defense workers (Kapstein, 1993). Additionally, layoffs due to downturn could impact a defense industry worker regardless of reputation.

However, with the lingering effects of the Great Recession and anticipated low GDP growth, the industry and government would seem to be facing a major predicament. This latest cycle of reduction is not expected to yield any savings or "peace dividend" because the defense build-up since the 1980s and the wars in Iraq and Afghanistan are funded by borrowed monies, not tax revenues. Therefore, any "saving" would automatically go to pay down the debt and not be available for other government programs such as unemployment benefits and worker retraining (Brinner, 1993).

As mentioned before, the employment impact of previous defense spending downturns was circumvented as a thriving economy and supporting credit easing policy of economic stimulus (Kapstein, 1993) easily absorbed the defense layoffs. However, the defense spending downturn of 2013 may cause a prolong drag on the U.S. economy since the rest of the economy remains in a slump and the Federal Reserve, in an attempt to control the impact of the recession, has exhausted all avenues for stimuli. Kapstein (1993) estimates the continued downturn in the defense industry would multiply throughout the remainder economy to losses of about two-and-one-half times the direct reduction – for every dollar of lower defense spending, there would be approximately $1.50 lost in consumer retail sales. In the next section, I will discuss the idea of free market and its applicability to the defense industry.

Defense Procurement as a Closed Market

Business dealings within the U.S. economy are usually perceived to be and are generally desired to be part of the free-market system. However, the defense industry deviates widely from the conventional wisdom of free market theory (Gansler, 1986). Recent quantitative studies such as one by Rundquist and Carsey (2002) and the continued monitoring of the industry by the U.S. General Accounting Office (GAO) (General Accounting Office Report,

1998; General Accounting Office Report, 2013) tend to focus on pork barrel spending rather than consider the possible issues with the overall industry structure. We see a different picture if we evaluate the defense industry using the framework of a true free-market lens. For example, to return to Table 1 (see Table 1), it provides a summary of the various parts of the defense industry and their relative "openness." Simply, the primes and arsenals do not completely function as part of the free market because there is only one customer, one or few suppliers of the desired system, and entry into the market is difficult.

Free-market system - The invisible hand. According to Gansler (1986), a free market has a tendency to regulate itself by means of competition, supply and demand, and self-interest. Adam Smith called this phenomenon *the invisible hand*. Generally, a free market is made up of many buyers, many sellers, and prices set by the market (Muller, 1993). A free market works by responding to changes in supply and demand. There are large quantities involved over many transactions that help limit profits. Over time, the iterative relationship between production cost, profits, and competition brings about a stability and downward trend in price, commonly called equilibrium. The existence of a free market does not completely eliminate the need for government since it is necessary as a forum for determining the rules of the game and as an umpire to interpret and enforce the rules decided on (Freidman, 1962).

In a free market, the government has limited involvement in setting up a forum for determining the "rules of the game," ensuring safety, and to "umpire the game" to interpret and enforce the rules decided on; but has no connection with setting the price, quality, or quantity levels (Antonio, 2003). The system provides barrier-free movement in and out of the market. Free markets also have a built-in risk that competition will take away your market share if they have a better or cheaper product (Gansler, 1986).

Free-market system - The invisible foot. The U.S. defense industry is not a traditional free market with many buyers and many sellers and limited regulations. According to Harrison (2012b), the industry can best be described as a "monopsony" with the U.S. government as the sole customer and chief regulator. There are possible other foreign customers but in all cases, these sales are significantly smaller, highly regulated, restricted to a few allied countries, and with technology strictly controlled by the U.S. government. Also, there are a limited number of vendors capable of producing the weapon systems – just one or two primes in some sectors.

"In these instances, the defense industry is a monopsony-duopoly [two vendors] or a bi-lateral monopoly [one vendor] [and not a free market] (Harrison, 2012b). According to Bowles and Edwards (1993), the condition that brings about a failed free-market is call *the invisible foot*. Hence the title of this subsection. However, the monopsony characteristics at play in the defense industry are not entirely altruistic.

The defense industry is highly regulated and Pentagon acts as a regulator, bank, product specifier, and judge of claim (Gansler, 1986). Likewise, Entry to the defense industry at all levels is very restrictive. Entry requires demonstrated capability and adherence and history with required regulations. These activities would require significant resources just to prepare to put in a contract bid. Additional regulations such as buy-American (at any cost, schedule, or quality), OSHA, and EEO also come into play (Gansler, 1986) and would require a new player to heavily invest in personnel and infrastructure without any guarantee of contract award. Even so, for a new company without any history on the product, it would be impossible for the Pentagon to award a contract (Rundquist & Carsey, 2002).

In addition, defense products have a reverse price-to-demand relationship. In a free-market system the prices will fall when the demand is reduced but in the defense industry prices

rise when the demand is reduced. Put another way, regardless of demand prices are always rising in defense economics. Additionally, the cost is not directly incurred by Pentagon or Congress since it is the U.S. taxpayers who foot the bill and price controlling is counter-productive for Congress and the Pentagon since it would mean less money under their control. Likewise, the prime defense contractors face no risk with cost plus or fixed price contracting.

In defense of the defense industry. Why does the industry believe that this is the best business model to achieve their needs for equipment and services? The Pentagon looks to manage the industry by requiring the defense contractors to be self-sufficient, with excess capacity in times of need, and a constant demand for weapons for the future. However, the reality of the procurement system is far from this idealistic scenario. Contractors are set up with an implied promise for purchase of their products but, the Pentagon is fickle. It has been known to reduce number of units or outright cancel on-going programs. This behavior greatly impacts a contractor's ability to predict and manage business cycles. These contractual upheavals are so pervasive that industry members already have a built-in method of using historic basis of estimates for future contracts.

Defense legislation has always attempted to achieve "fairness" by providing for a uniform procurement practice. However, the defense industry is so diverse that rote application of uniform government policies seem to lead to additional undesirable performance and costs. Also, the "fairness" theory and the federal regulations say that competition should be a required norm for the business; however, most defense-contractor money is awarded on a sole-source basis, and less than 8% is awarded on the basis of price competition (Gansler, 1986). These regulations, established with free-market assumptions, are unlikely to improve efficiency and have often made things worst (Watts & Harrison, 2011).

It should also be agreed that truly free market designation is most characteristic of cheaper and mass produced consumable items; often at the back end of their marginal profits. Cutting edge products in the defense industry are often closely guarded; and likely operating within a quasi-monopoly environment. Complex weapons are much more like the latter than the former. They take significant time (seven to ten years in some cases) to develop and manufacture (Gansler, 1986). Thus, the defense industry is more a niche market in which free-market principles are inappropriate.

In defense of the Pentagon. Why does the Pentagon constantly walk a fine line between their weaponry needs and its ability to satisfy the laws and regulations? In attempting competition, they have been burned by high costs, non-delivery, and poor quality products because these products take too long to develop and produce and, due to the changing environment, become redundant before they reach production. Therefore, Pentagon attempts to do the best it can to meet their mandate in an environment of limited and fluctuating funds as well as conflicting interests between the Pentagon, the contractors, and the U.S. legislature (which funds Pentagon activities). Simply, this is one step better than government owned arsenals building weapons like in our history and what presently happens in Russia.

This industry is not a homogeneous set, and not all members benefit from the established method of weapons procurement. As mentioned before, the legislated need for "fairness" (by providing for a uniform procurement practice) hinders the Pentagon by adding additional levels of bureaucracy at the agency and limiting the agency's ability to react quickly to changing circumstances.

According to Watts and Harrison (2011), fundamental decisions about what weapons to develop; priorities to be given to cost, schedule and performance; and the annual funding

allocation for various weapons programs are the result of complex negotiations. These negotiations are often politicized interactions between the military service, war-fighting communities, the Joint Chiefs of Staff, the office of the secretary of defense, the White House, and Congress. Additionally, Congress has regulations that force Pentagon to spend allocated funds or lose funding at the end of the fiscal year. This "use or lose" method often creates a false need. Likewise, Congress has the ability to "up" specific weapons allocation depending on where they are developed and produced, regardless of need. Unlike a free-market, the size of the market is neither fully established by Pentagon (the buyer) or the defense industry (the seller) but is highly susceptible to alteration by third parties such as Congress, the White House, and lobbyists (Gansler, 1986).

So how does the defense market work overall? According to Gansler (1986), "the theory of second best" should be applied. This theory states that if some conditions of the traditional free market ("the first best") do not apply and cannot be created, then the degree of deviation from the free market will determine the amount of inefficiency and ineffectiveness. The method of purchasing weapons is suitable to the situation but by no means perfect. Any other methods of procurement may violate, lower, and expose the country's military capabilities (keeping weapons and capabilities as state secrets), and it also compromises the Pentagon's ability to manage.

Players and influencers. Based on data from the mid-late 20th Century, Rundquist and Carsey (2002) demonstrate that there is no clear evidence that defense corporations benefited in any way from Congressional positions. Their study shows that the defense funding follows technical expertise. However, the Rundquist and Carsey studies spanned the period when one party, the Democrats, ruled both the House and the Senate before the resurgence of the Republican led

Congress during the Reagan era. This meant that the Pentagon "pie" was distributed to a constant set of states over the period of Democratic control which manifested as "expertise" during the Rundquist and Carsey Study. Looking at the data after the Republican takeover would probably show different results.

Research by Lee (2000), in contrast, suggests that the senate's equal representation of states (two senators per state regardless of state population) shapes coalition building in distributive politics. The greater variation in state population means that some states have far greater need for federal funds than other, but all senators have equal voting weight. As a result, even though all senators' votes are of equal value to the coalition builder, they are not of equal price. Coalition builders can include benefits for small states at considerably less expense to program budgets than comparable benefits to more populous states. The final outcome of distributive policy more closely reflects the preferences of small-state coalitions than large state senators.

The Congressional influence on what occurred at ACME South (see Chapter 3) may be anecdotal evidence; the business unit is heavily supported by South State's Congressional member on the Senate Appropriation Committee. This is apparent since South State, a state that was traditionally in the bottom tier of military expenditures, has moved to the middle tier and continues to rise since the senator's appointment to the committee (Rundquist and Carsey, 2002). For example, in 1996 this privatization was questioned by the GAO and, according to analysis, this business deal was expected to be more costly to the U.S. government than shutting down the business and transferring the work to other government arsenals (General Accounting Office, 1998).

New Public Management to Overcome Good People Trapped in Bad Systems

One possible path forward for the industry is for the Pentagon to continue with further privatization and adopting new management tools that would align the organization with the doctrine of New Public Management (NPM). This doctrine claims to offer an all-purpose key to better provision of public or government services (Hood, 1991). The rise of NPM over the past 35 years is one of the most striking international trends in public administration. This trend accounts for attempts to slow down or reverse government growth, a shift towards privatization and semi-privatization, the development of automation, and more inter-government cooperation.

NPM is broadly the set of government policies that are aimed at modernizing government agencies and public institutions to be more effective (Hood, 1991; Kaboolian, 1998). The doctrine which is made up of various overlapping precepts, would impact the Pentagon as well as the defense contractors. For the Pentagon, the focus would be on increasing cost efficiencies by adopting market-oriented management tactics. NPM would require greater competition, private sector style management, and disciplined use of resources from the defense contractors.

Some of these reforms are already underway in many U.S. government agencies and other foreign governments. Though this set of administrative reforms may fade from the scene in the future, the infusion of market principles into these systems will have a longer lasting effect (Kaboolian, 1998).

What is NPM? NPM is an amalgamation of two different streams of ideas. One idea is the "new institutional economics." This movement helped bring about ideas of contestability, user choice, transparency, and incentive structures. The other idea is the injection of administrative reforms and professional management expertise into the public sector for improved organizational performance and increased output (Hood, 1991). It is beneficial to look at policy

making, implementation, and delivery as a series of transactions of negotiated contracts (Kaboolian, 1998).

According the Hood (1991), administrative design can fall into one of three groups based on the values desired. These groups and corresponding design are provided in Table 2 (see Table 2). The defense industry aims for Sigma-type NPM values for frugality and managed inefficiencies. Hood (1991) goes on to say that Sigma-type NPM includes characteristics such as just-in-time inventory control with expected rapid delivery by suppliers; results based payments; and low administrative cost.

NPM and the defense industry. It would be prudent to acknowledge that the defense industry is a complex government-business structure made up of multiple influencers that each could benefit from selecting their own values from Table 2 (see Table 2). For example, the Pentagon would probably adapt a Lambda-type NPM that focusses on robustness of defense and the long-term viability to protect and defend the country. Likewise in the interest of political "cover" if not simple fairness, Congress would target at Theta-type NPM that focusses on honesty and fairness. Sigma-type NPM would provide for best practice and frugality would be applicable at individual program level. The Sigma, Theta and Lambda type NPM values are further explained in Table 2 (see Table 2).

This complexity of the overall defense acquisition system also begs for simplification. Kaboolian (1998) argues that government agencies reflect politics - and therefore the health and improvement - of the current administration. Unless there are meaningful changes to the underlying politics that causes the Pentagon's role to meaningfully shift towards a purely customer orientation, these organizations are not allowed to use Sigma-type values.

Table 2. Three sets of core values in public management (Hood, 1991)

	Sigma-type Values KEEP IT LEAN AND PURPOSEFUL	*Theta-type values KEEP IT HONEST AND FAIR*	*Lambda-type values KEEP IT ROBUST AND RESILIENT*
STANDARD OF SUCCESS	*Frugality* (matching of resources to tasks for given goal)	*Rectitude* (achieving of fairness, mutuality, the proper discharge of duties)	*Resilience* (achieving of reliability, adaptability, robustness)
STANDARD OF FAILURE	*Waste* (muddle, confusion, inefficiencies)	*Malversation* (unfairness, bias, abuse of office)	*Catastrophe* (risk, breakdown, collapse)
CURRENCY OF SUCCESS AND FAILURE	*Money and time* (resource costs of producers and consumers)	*Trust and entitlement* (consent, legitimacy, does process, political entitlement)	*Security and survivability* (confidence, life, and limb)
CONTROL EMPHASIS	*Output*	*Process*	*Input/Process*
SLACK	*Low*	*Medium*	*High*
GOALS	*Fixed/Single*	*Incompatible* 'Double bind'	*Emergent/Multiple*
INFORMATION	Cost, segmented (Commercial assets)	Structured	Rich exchange, collective assets
COUPLING	*Tight*	*Medium*	*Loose*

Applying the NPM characteristics set in table 2 (see table 2), one can notice that the ACME North may have a false understanding of the ACME South's core values. Having survived major industry upheavals and corporate changes, ACME South is a Lambda-type (*Keep it robust and resilient*) whereas ACME North may have wanted them to be a Sigma Type (*Keep it lean and purposeful*). ACME South's core values are in their very makeup and may require more time and effort to change from Lambda-type.

Section 2: Defense Engineering

> I am an Engineer. In my profession I take deep pride. To it, I owe solemn obligations.
>
> As an Engineer, I pledge to practice integrity and fair dealing, tolerance and respect, and to uphold devotion to the standards and the dignity of my profession, conscious always that my skill carries with it the obligation to serve humanity by making the best use of Earth's precious wealth.
>
> As an Engineer, I shall participate in none but honest enterprises. When needed, my skill and knowledge shall be given without reservation for the public good. In the performance of duty and in fidelity to my profession, I shall give the utmost.
>
> - Organization for the Order of the Engineer (2014)

In this section I will describe how engineering is accomplished during a typical product development cycle in order to better understand the defense engineer and field. I will provide a general description of what an engineer does, compare and contrast defense engineers with commercial engineers, and describe how a product is engineered in the defense industry to show the role of engineering in the development of a defense product.

The field of Engineering

Bourdieu (1984) describes a field as a network of professional and personal relationships within a hierarchy that provides for a venue for collecting and generating power. Engineering encompasses a broad array of roles, disciplines, and industries, from design to management, from civil to mechanical to environmental engineering, and from natural resource extraction to manufacturing to public infrastructure (Campbell, 2010). Defense engineering is therefore a subset of engineering and is associated with research, development, manufacturing, and support of weapons systems and associated technologies. Defense engineering is the application of science to the research, development, and technical management of weapons (such as bombs,

missile, bullets), weapon delivery systems (such as guns, missile launchers), and weapon platforms (such as planes, tanks, ships).

Defense Acquisition Process

The product development cycle is prescribed and contractually stipulated by the Pentagon for development of all military products. These contractual stipulations include DoD's Directive 5000.01 and DoD Instruction 5000.02. This product development cycle is an event based defense acquisition management system. The overall framework is described in Figure 2 (see Figure 2). I have provided an overview of the process based on the Defense Acquisition Guidebook (2013), a 1248 page document, which describes the details of the Defense Acquisition System.

To better understand the terminology of the industry, systems development and product development should be considered synonymous. A system can be looked at as a process as well at as a collection of subsystems and components that are needed to create a product.

Most engineering takes place during the Materiel Solution Analysis, Technology Development, and Engineering and manufacturing development phases. The objective of the Materiel Solution Analysis (MSA) phase is to select and adequately describe a preferred materiel solution to satisfy the phase-specific entrance criteria for the next program milestone designated by the Milestone Decision Authority (MDA). Usually, but not always, the next milestone is a decision to invest in technology maturation and preliminary design in the Technology Development (TD) phase. The engineering activities in the MSA phase result in several key products. First, a system model and/or architecture is developed that captures operational context and envisioned concepts, describes the system boundaries and interfaces, and addresses operational and functional requirements. Second, a preliminary system performance

specification is developed that defines the performance of the preferred materiel solution. Third, the engineer advises the program manager on what is to be prototyped, why, and how.

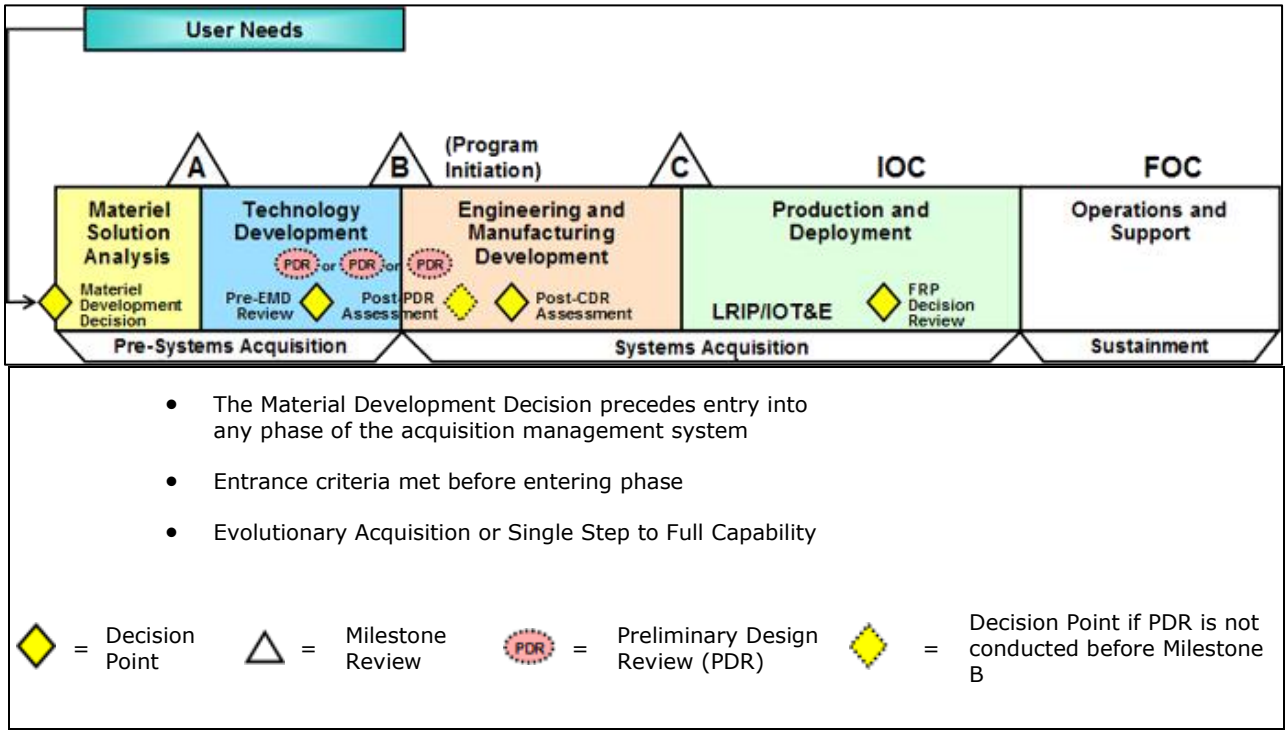

Figure 2. Defense Acquisition phases, decision points, and milestones.

During the MSA phase, the program team identifies a materiel solution to address user capability gaps partially based on an Analysis of Alternatives (AoA) (i.e., analysis of the set of candidate materiel solutions) led by the Director, Cost Analysis and Program Evaluation (CAPE) and conducted by an organization independent from the Program Manager. Once the Service sponsor selects a preferred materiel solution, the program team focuses engineering and technical analysis on this solution to ensure development plans, schedule, funding, and other resources match customer needs and match the complexity of the preferred materiel solution (The Defense Acquisition Guidebook, 2013).

The primary objective of the Technology Development (TD) phase is to reduce technical risk and develop a sufficient understanding of the materiel solution to support sound investment

decisions at the pre- Engineering and Manufacturing Development (EMD) Review and at Milestone B regarding whether to initiate a formal acquisition program. The engineer supports the production of a preliminary system design that achieves a suitable level of system maturity for low-risk entry into EMD. Usually the engineer implements a strategy of competitive prototyping on a system element or subsystem level, balancing capability needs and design considerations to synthesize system requirements for a preliminary end-item design for the system. The major efforts associated with the TD phase are:

- Determine the appropriate set of technologies to integrate into a full system.
- Mature the technologies including demonstrating and assessing them in a relevant environment.
- Conduct competitive prototyping of the system and/or system elements.
- Perform trade studies, refine requirements, and revise designs.
- Develop the preliminary design, including functional and allocated baselines, specifications, interface control drawings/documents, architectures, and system models.
- Perform developmental test, as appropriate.

During the TD phase, the program develops and demonstrates prototype designs to reduce technical risk, validate design approaches, validate cost estimates, and refine requirements. In, addition, the TD phase efforts ensure the level of expertise required to operate and maintain the product is consistent with the force structure. Technology development is an iterative process of maturing technologies and refining user performance parameters to accommodate those technologies that do not sufficiently mature (requirements trades). The Initial Capabilities Document, the Technology Development Strategy (TDS), Systems Engineering Plan (SEP), and draft Capability Development Document (CDD) guide the efforts of this phase.

There are two key technical objectives in the TD phase: technical risk reduction and initial system development activity, culminating in preliminary design. The engineer in the TD phase manages activities to evaluate prototyped solutions (preferably competitive prototypes) against performance, cost, and schedule constraints to balance the total system solution space. This information can then be used to inform the finalization of the system performance specification as a basis for functional analysis and preliminary design.

Effective engineering, applied in accordance with the SEP and gated by technical reviews, reduces program risk, identifies potential management issues in a timely manner, and supports key program decisions. The TD phase provides the Program Manager with a preliminary design and allocated baseline that are realistic and credible.

The primary objective of the Engineering and Manufacturing Development (EMD) phase is to develop the product baseline, verify it meets the system functional and allocated baselines, and transform the preliminary design into a producible design, all within the schedule and cost constraints of the program. Engineering activities support development of the detailed design, verification that requirements are met, reduction in system-level risk, and assessment of readiness to begin production and/or deployment. Primary engineering focus areas in EMD include:

- Complete the detailed build-to design of the system.
- Establish the product baseline.
- Conduct integration and tests of system elements and the system (where feasible).
- Demonstrate system maturity and readiness to begin production for operational test and /or deployment and sustainment activities

The EMD phase includes technical assessment and control efforts, including value engineering techniques to effectively manage risks and increase confidence in meeting system performance, schedule, and cost goals. The planning, scheduling, and conduct of event-driven technical reviews (Critical Design Review (CDR), Functional Configuration Audit (FCA), System Verification Review (SVR), and Production Readiness Review (PRR)) are vital to provide key points for assessing program maturity and the effectiveness of risk-reduction strategies.

A detailed and well-documented EMD phase Systems Engineering Plan (SEP) builds on the results of previous activities and significantly increases the likelihood of a successful program compliant with the approved Acquisition Program Baseline (APB).

Implementing the technical plans as defined in the approved SEP guides the execution of the complex and myriad tasks associated with completing the detailed design and integration, and supports developmental test and evaluation activities. The SEP also highlights the linkage between Technical Performance Measures (TPM), risk management, and earned-value management activities to support tracking of cost growth trends. Achieving predefined EMD technical review criteria provides confidence that the system meets stated performance requirements (including interoperability and supportability requirements) and that design and development have matured to support the initiation of the Production and Deployment (P&D) phase.

Defense Engineering Fundamentals

The actual work expected from a defense engineer is well described in various guidebooks including the Systems Engineering Fundamentals (Defense Acquisition University, 2014). The book focuses on the process of managing the engineering conducted on a defense

product. The engineering process of getting from an idea to a proven solution is shown in Figure 3 (see Figure 3).

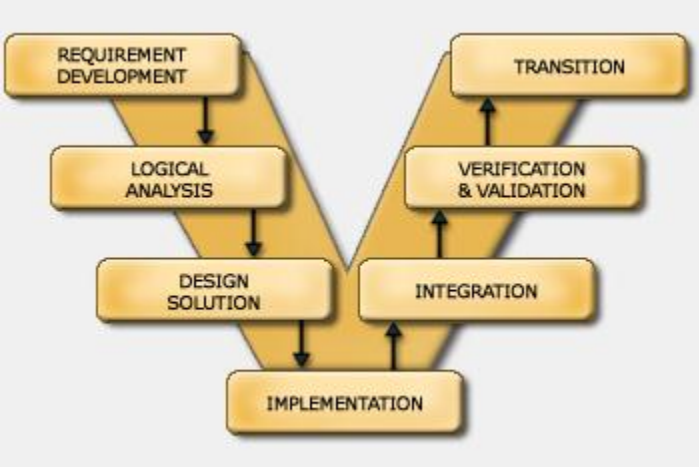

Figure 3. The Engineering "V" diagram

Simply, the left side of the diagram is called the design side where requirements are developed and allocated to sub systems and the subsystems are then designed to meet these requirements. The right side of the diagram shows the product realization side which includes the fabrication, integration and test. Production normally takes place after these events. This process is far more intricate when used on complex systems (Defense Acquisition University, 2014). There are also many sub-steps that I've not explained. In summary, this can be a complicated process to implement and many things can go wrong.

How Defense Engineers are Socialized, Assessed, and Evaluated

Defense engineers are socialized through a process of mentorship and teamwork. Most defense products are developed by a team (commonly called development team), and an engineer assigned to that team is expected to diligently execute assigned tasks in order to support cost, schedule, and quality drivers.

Each product under development requires a specific set of mix of engineers to realize. There are many types of engineering specialties or disciplines including mechanical, electrical, software, systems, aeronautical, chemical, and materials; depending on the project needs, the right mix of engineering specialists is collated into a product team.

Each engineer brings a specialized set of common sense, or practical expertise, to work and continues to collectively and incrementally add to this common sense. Under these conditions, engineers are also exposed to and benefit from previous technical issues and solution in areas otherwise beyond their training and responsibilities. Therefore, the development team, made up of the various engineering disciplines (mechanical engineers, electrical engineers, software engineers, etc.,) is a grouping of collective knowledge that continues to add to the group's acumen as well as each e individual's practical knowledge as they achieve their goals. This knowledge and experience then adds to the group's symbolic capital. It does the same for the individual members (Bourdieu, 1977 & Bourdieu, 1990b).

Both the ACME North and ACME South business units are part of a common field since they are part of the defense industry and involved with the same product lines. Both business units have also worked fairly closely since 1941 since many of the spare parts, re-engineering, and new documentation were provided by ACME North to ACME South. Likewise, changes to drawings, historic documentation, and issues reports were provided by ACME South when needed by ACME North. In a way, ACME South was a customer of ACME North.

Bourdieu (1984) also describes a field as the arena of struggle for maintaining or improving positions with regards to others in the field. This is where the two business units are also very similar. Though one was a for-profit company and the other was a Navy arsenal, they

both survived to this day where as many others in the industry have withered and gone. These two business units have adjusted and changed in an unpredictably disruptive environment.

Section 3: Relevant Analytical Theories

This case study analyzed the findings using grounded social science. I combined the method of Charmaz (2009) with the theories of Flyvbjerg (2008), Bourdieu (1977), and Goffman (1961). Since *phronesis* and professional reputation as central to this study of two hero engineers, I used Flyvbjerg to determine "power" in the system, apply *phronesis* to my analysis, and link the human learning process to the development of a professional reputation. I used Bourdieu to explain the conditions, environment, and power structures of the relationship between the two business units, and linked power to professional reputation. I applied Goffman's "moral career," or professional reputation, to the field of defense engineering to explain the experiences of the two hero engineers. In this section I will describe each of these theorists and the relevance of their theories to this case study. I will also attempt to weave the three theorists, Flybjerg, Bourdieu, and Goffman as applied to *phronetic* behavior and development of a professional reputation.

Flyvbjerg and the Study of Human Activity

According to Flyvbjerg (2008), there is a "Science War" going on between the natural and social scientists. Natural scientists accuse social scientist of shoddy scholarship and for not applying natural science methodologies. Social scientists retort back that not all human scholarships can fit into the natural science models and require alternate methods. Flyvbjerg (2008) judges this Science Wars as misleading, misguided and counterproductive. The two types of science have their respective strengths and weaknesses along fundamentally different dimensions. He provides a path out of this antagonism by recommending the application of

phronesis, variously translated as prudence or practical wisdom. He believes that both sides would benefit from applying *phronesis* to their studies.

Flyvbjerg's Critique of Natural Science. According to Flyvbjerg (2008), the natural-science model has been, and continues to be, an ideal shared by several traditions in the study of human activity.

> There is a logical simplicity [or analytical rationality] to the natural science paradigm, and the natural sciences' impressive material results speak for themselves; these sciences certainly have an undeniable basis as a means by which we have attempted to achieve mastery over nature, technology, and over our own condition of life. (Flyvbjerg, 2008, p.26).

> ….. advances in natural science research and technology progress are founded upon relatively cumulative production of knowledge, the key concepts being explanation and predication based on context-independent theories. (Flyvbjerg, 2008, p.26).

The need for the subject to be context-independent implies that the application of natural science methodologies require the absence of value or judgment. Therefore, natural science based research is unable to easily answer questions of value, judgment, power, conflict, opinions, intuition, reflection, beliefs, conscientiousness (the awareness of being right of wrong in one's behavior), and morality. As it is, natural-research scientists are unable to completely remove their biases since they select topics, collect subject data, conduct analyses, and develop conclusions.

Flyvbjerg's Critique of Social Science. A critical lens that affords us an insight into engineering, technology, and science workers in general is the use of Flyvbjerg's (2008) concept of *phronesis* and its applicability to generalization for social science investigations. He believes that natural science and social science have been at odds with each other over methodologies

because natural scientists such as physicists and chemists, who typically work with tangible data and universally acceptable theories, have a tendency to expect the same from social scientists.

Additionally, they are questioning the legitimacy of social science research. Natural scientists say social research results are irrational, or at least not helpful, since they cannot generally produce concepts suitable for universal application. To avoid this this criticism, some social science disciplines have emulated natural scientific methodologies. In response to criticism and the negligible gains produced by mimicking the natural science methods, social scientists have criticized that natural science cannot be used on all phenomena and that a lot of social science investigations transcend natural science oriented investigations. Social scientists also contend that where [natural] science cannot reach, art, literature, and narrative help us comprehend the reality in which we live. Further, and as is reflected in much art and literature, natural science's attempts to isolate preset variables and argue for "value-free" applications ignore much of how human authorities operate.

Flyvbjerg and Power. According to Flyvbjerg (2008), the following questions concerning power and its use cannot be adequately answered by natural science research:

1. Who can adversely affect whose interests?
2. Who can control whom?
3. Who can obtain what?
4. Who can secure the achievement of collective resources?
5. Who is responsible for the outcome of power?
6. Who benefits from the outcome of power?
7. Where are the sources of change localized?

8. Where are the points at which alternative arrangements or events could have made a significant difference?

However, Flyvbjerg (2008) feels these are not enough to fully understand power as a force relations and he offers Foucault's definition and one key question: How is power exercised?

> "Power is not something that is acquired, seized, or shared, something that one hold on to or allows to slip away. Power is exercised rather than possessed. Power is not an institution, and not a structure; neither is it a certain strength we are endowed with; it is the name that one attributes to a complex strategical situation in a particular society." (Flyvbjerg, 2008, p. 117).

Flyvbjerg (2008), leveraging Foucault, states that one should analyze institutions from the standpoint of power relations rather than vice versa. He goes on to define the conventional view of power as:

> "..*negative*: limits and prohibitions are central to its logic.
>
> …*rules based*; rules determine what is permitted and forbidden, legal, and illegal, acceptable and unacceptable, and what constitutes legitimate and illicit behavior [sometimes experienced as inferred leverage or positional power that is present in the system but rarely invoked].
>
> It requires a uniform and visible *apparatus* of power; power is exercised from above and downwards, uniformly and comprehensively; all are equal before power, differences are attributable only to differences in scale, not in type of power to which it is exposed.
>
> The power apparatus is placed on the one side, the obedient subject on the other.
>
> It is power that only has the force of the negative on its side – a power to say no; in no condition to produce, capable only of posting limits, it is basically anti-energy." (Flyvbjerg, 2008, p. 119).

Flyvbjerg (2008), again leveraging Foucault, recommends taking on a more comprehensive perspective and expands the definition of power. With this addition, power is

more than a set of institutions and mechanisms that ensure servile citizens in a given state; more than a form of subordination which instead of violence, sets rules; and more than the general system of domination that one group exercise over another. This expanded view defines power in terms of force relations which are changeable and unstable:

> "Power must be understood as a multiplicity of force relations "imminent in the sphere on which they operate and which constitute their own organization."
>
> Power is the process, which via struggles and confrontations transforms, supports, or reverses these force relations.
>
> Power is the support which the force relations find in each other via the creation of chains or systems, or conversely, via the separation and opposition which isolate then from each other.
>
> Power is the strategies in which the force relations obtain effects ….in the forms of laws and various social hegemonies.
>
> Power is dynamic and everywhere … and is produced from one moment to the next in all points and all relations.
>
> Power is productive and should not only be described in negative terms: it 'excludes,' it 'represses,' it 'censors,' it 'abstracts,' it 'masks,' it 'conceals'. In fact, power produces, it produces reality; it produces domains of object and rituals of truth." (Flyvbjerg, 2008, p. 121).

According to Flyvbjerg, Foucault's proposed concept of power is as follows:

1. *Power relations do not stand in an external relationship to other forms of relationships.* For example, power relations are inherent in economic process, relations of knowledge and rationality, or sexual relations. Also that the power relations bring about the immediate effect of divisions [or unions], inequities [or equities], and imbalances [or balances] found in the relations.

2. *Power [sometimes] comes from below*. Power is not based upon a bipolar and comprehensive opposition between ruling and ruled. There exists no general ordering of power. This does not mean that social classes and social domination do not exist. It means only that both the dominant and the dominated enter into relations of power which none of them control in a simple absolute way.

3. *Power cannot be "acquired," "taken," or "shared" nor can it be retained or allowed to" slip away."* Power is exercised from innumerable points in an interaction between unequal and mobile relations. Inequities in power relations must be traced back to their actual material functioning.

4. *Where there is power, there is resistance*. In the relations of power, there is necessarily the possibility of resistance. If there is no possibility of resistance… there would be no relations of power. Therefore, the study of the antagonism in the system may be used to analyze power. (Flyvbjerg, 2008, p. 121).

5. *Real Change in power requires changing ourselves, our bodies, our souls, and our ways of knowledge.* It requires "work of the self upon the self." (Flyvbjerg, 2008, p. 122).

In addition to asking the standard "Who? – What? – Where?" questions, Flyvbjerg recommends a *phronetic* point of departure to questions. I will describe *phronesis* in the next section but in the meantime, these *phronesis* based questions are:

1. What are the most immediate and most local power relations operating, and how do they operate?

2. How are the power relations linked together, according to what logic and strategy?

3. How do the rationalities support or oppose the power relations?

4. How can the games of power be played differently (Flyvbjerg, 2008)?

Recommended Path - *Phronesis*. Flyvbjerg (2008) agrees that the criticism of social science is right but offers a method to overcome this impasse: Instead of emulating the natural sciences and creating a general theory, he tells us to focus on the strength of social science which is in the rich, reflexive analysis of values and power. He recommends using the idea of *phronesis*.

> In Aristotle's words, *phronesis* is a "true state, reasoned, and capable of action with regard to things that are good or bad for man." (Flyvbjerg, 2008, p. 2).

> …*phronesis* emphasizes practical knowledge and practical ethics. *Phronesis* is often translated as "prudence or practical common sense." (Flyvbjerg, 2008, p. 56).

> "*Phronesis* is what permits one to chase away false opinions and make good decisions." (Flyvbjerg, 2008, p. 110).

Therefore, *phronesis* goes beyond both analytical, scientific knowledge (episteme) and technical knowledge (techne) and involves intuition, judgments and decisions made in the manner of a virtuoso social and political actor. Simply, *phronesis* allows us to analyze values – things that are good or bad for us. Intuition does not mean some kind of guesswork, irrationality, or supernatural inspiration but a property that each individual uses in everyday life. This intuition transcends rules-based behavior because an expert already has related experiences that can be drawn upon by holistically discriminating among classes of situations and developing an appropriate response to a new situation. In the long run *phronesis* is what permits one to chase away false opinions and make good decisions (Flyvbjerg, 2008, p. 110).

> Intuition is the ability to draw directly on one's own experience – bodily, emotional, intellectual –and to recognize similarities between these experiences and new situations. Intuition is internalized; it is part of the individual. (Flyvbjerg, 2008, p.21).

In light of the logic of Flyvbjerg's critique of contemporary social science, it is important to understand power in order to understand the defense industry. Operationalized in this study, and following Flyvbjerg's assumption of *phonetic* research's guiding questions, the following four value-rational questions guided the research:

1. Where are we going?
2. Who gains and who loses, by which mechanism of power?
3. Is it desirable?
4. What should be done?

Various ideas presented by Flyvbjerg are well represented in this case study. The defense business is heavily focused in engineering and mathematics and therefore, tends towards a mentality where quantitative analysis plays a significant role in decision making. Simply, having used quantitative means, there is a pervasive mentality that we can engineer through the various human and social "obstacles." This mentality is evident in the focused attention to "engineering utilization," Earned Value System, and number of employees at ACME South. Quantitative means are necessary but, there is a place and a use for these means, especially is engineering design and analysis. Beyond that, in order to find meaning, future implications, and a holistic solution, one has to turn to qualitative analysis. Therefore, in defense engineering, there needs to be a balance between qualitative and quantitative analysis in defense engineering evaluation. Applying Flyvbjerg (2008), as an engineer continues to develops skills and professional reputation progressing from a novice, on to advanced beginner, competent performer, to proficient performer, and ultimately to expert; at each stage, an engineer move from a quantitative mindset to a more qualitative mentality.

Human-Learning Process Model. Flyvbjerg leverages the Dreyfus and Dreyfus model of Human-Learning Process and links this process to *phronesis*. This process is made up of five levels including novice, advanced beginner, competent performer, proficient performer, and expert. Individuals progress through these levels as they learn a given skill (Dreyfus & Dreyfus, 1986). Not all people achieve the higher levels in a given filed. Table 3 (see Table 3) provides the general descriptions of the various levels in the Dreyfus and Dreyfus model.

Table 3. Dreyfus and Dreyfus Model Levels (Dreyfus & Dreyfus, 1986)

Level	**Analysis Type**	**Description**
Novice	Quantitative	Acts on the basis of context-independent elements and rules.
Advanced Beginner	Quantitative	Adds situational elements which they have learned to identify and interpret on the basis of their own experience from similar situations.
Competent performer	Quantitative	Uses goals and plans as a basis of their actions to structure and store masses of both context-dependent and context-independent information.
proficient performer	Qualitative	Identifies problems, goals, and plans intuitively from their own appropriately based perspective. Intuitive choice is checked by analytical evaluation prior to action.
expert	Qualitative	Behavior is intuitive, holistic, and synchronic, understood in a way that a given situation releases a picture problem, goal, plan, decision, and action in one instant and with no division into phases. Experts are characterized by a flowing, effortless performance, unhindered by analytical deliberation.

Existing research provides no evidence that intuition and judgment can be externalized into rules and explanations, which, if followed, lead to the same results as intuitive behavior. Experts add judgment, practice, trial and error, experience, common sense, intuition, and bodily sensation to analysis and rationality to reach decisions. According to Flyvbjerg (2008),

> Rational or rules based thinking generally constitutes an obstacle to good results, not because rules and rationality are problematic in themselves, but because the rational perspective has to be elevated from being necessary to being sufficient, even exclusive. This has caused people to become blind to context, experience, and intuition, even though these phenomena and ways of being are at least as important and necessary for good results as are analysis, rationality, and rules. (Flyvbjerg, 2008, p. 24).

Flyvbjerg (2008) further differentiates an expert as emphasizing understanding as distinct from explaining and the ability to identify relevant facts within a given situation. Channeling Aristotle, Flyvbjerg (2008) is able to apply *phronesis* as the context-based thinking, practice, experience, common sense, intuition, and practical wisdom. Therefore, an expert applies *phronesis* to their work.

Considering praxis, the iterative process of reflection and action, Flyvbjerg (2008) argues that conscientiousness begets ethical behavior, and an expert aims for ethical behavior though conscientiousness and *phronesis*.

Bourdieu and the Logic of Practice

Bourdieu's *Habitus* and Field. I applied Pierre Bourdieu's theory of *habitus* and field not only to provide an understanding of a defense engineer but also to the relationship between the two business units. The theory is that each individual, or social agent, occupies a multidimensional social space and the agent is not only defined by social class but also by every single kind of "capital" he or she can accumulate through social relations. Bourdieu (1984, 1990a, 1990b) shows that capital, includes the value of social networks, could be used to produce or reproduce inequity. Therefore, each agent engages in a specific complex of social relations in everyday practice or "field." The agent will develop a certain disposition, or *habitus*, for social action that is conditioned by position on the field (dominant/dominated, orthodox/heterodox, passive/aggressive, etc.). This *habitus* is then revealed through the agent's actions, thoughts, outlooks, and personalities (Bourdieu, 1990a).

Bourdieu (1984) describes *habitus* as the mental and cognitive structures used to interact within one's environment [or one's world]; the internalized methods, schemes, and procedures

used to understand, interpret, evaluate and judge one's condition, one's environment or others; the internalized structures that reflect one's class, age, gender, etc.; and the practical skills and dispositions necessary to navigate within one's field.

Bourdieu (1990b) also explains Class *habitus* as the homogenizing of group resulting from the homogeneity of the conditions of existence. Class *habitus* is the subjective but non-individual system of internalized structures, schemas of perception, conception, and action common to all members of that group [or class].

Bourdieu (1984) describes field as a network of relationships within a hierarchy that is occupied by people and constrained by established responsibility. Good examples of how a field operates include art, religion, science, education, higher education, technology, economics, and politics. Field is also the arenas of struggle for maintaining or improving positions with regards to others in the field. Participation in the field generates capital (economic, cultural, social, and symbolic). This capital is then used to compete and determine positions within the field and control the fate of others

Economic capital is based on accumulated economic means or resources that determine buying power. Cultural capital is based on the legitimate knowledge that allows for navigating one's field. Social capital is based on the valued social relationships and symbolic capital is based on the honor and prestige afforded to the individual (Bourdieu, 1984). Each group has a group capability or common sense that helps achieve goals; the application of this capability generates symbolic capital. Symbolic capital is also the set of resources available to an individual on the basis of honor, prestige, or recognition and series of value that one holds within a culture. Symbolic capital accumulates primarily from the fulfillment of social obligations that are embedded with potential for prestige (Bourdieu, 1990b).

In order to understand the defense industry environment, it is necessary to know what types of individuals gravitate towards a career in engineering. An engineer is typically driven by the idea of investigating, designing, and making new products. The engineer of today is socially competent and excited about the opportunities and challenges of developing and producing new products. Likewise, it is important to distinguish a defense engineer since this is a specialized form of engineering geared towards the development and production of highly-reliable, long-lasting defense systems. These defense engineers usually work on complex, long-term projects that can take up to five years to design.

The management of these complex engineering projects (organizing the work and managing to the allocated funding) also requires dealing with various inescapable business, Congressional, and pentagon bureaucracies that often hinder and interfere with progress. In all cases, the projects have to meet Pentagon acquisition cycle requirements and are executed in accordance with established government processes. Therefore, each project has its unique set of challenges since the field and individual *habitus* are a mix of multiple engagements in an organic, ever changing environment. I plan to use the following descriptions for *habitus*, capital and field.

Habitus. *Habitus* can be defined as a system of dispositions. Dispositions are the lasting, acquired schemes of perceptions, thoughts, and actions. The individual agent develops these dispositions in response to the objective conditions he or she encounters. Bourdieu (1990a) theorizes the agent's thoughts, or subjective mental experiences, are indoctrinated by the agent's [perceived] environment, or objective social structures. *Habitus* is similar to socialization but also accounts for expertise, knowledge, or skill that one has acquired in the field and is now an assumed, integral part of a person's thoughts and actions (Ritzer, 2007). *Habitus* can also be

used to analyze collective dispositions at the organization level. Thus a defense firm is more than the sum of the disposition of its individual employees since not all are exactly alike.

Capital. Bourdieu extends the notion of capital beyond the normal use in economics. He allows capital to also include social, cultural, and symbolic forms. Economic capital is the money and assets put to productive use. According to Siisiainen (2000), Social capital is the accumulating of actual or virtual durable networks of institutionalized relationships that can be leveraged to endorse, augment, or change a system. Applying this to my case, network power is the relationship between ACME, the Pentagon and Congress. Likewise, cultural capital is the competencies, skills, and qualifications that legitimize the holder's cultural authority. Sometimes cultural capital can be used to challenge economic capital.

According to Bourdieu (1990a), symbolic capital, such as prestige, honor and attention, is a crucial source of power that is not easily perceived or accepted as "capital." A holder of symbolic power uses the power, though social interaction, to influence and change an action of an agent who holds less. Bourdieu (1977) calls this *symbolic violence*. Symbolic violence is the implicit coercion conveyed through gestures, actions, and symbols to control and direct others and to promulgate the social order. This method of coercion is accepted as just by the dominant agent and legitimate and unquestionable by the dominated. I plan to look at the situation from social capital, cultural capital and symbolic capital and attempt to link Bourdieu's capital to Flyvbjerg's power.

Field. A field is a structured social space with its own management structure (schemes of domination), legitimate opinions, ideas, policies, processes, and procedures. Fields are relatively autonomous for the wider social structure [or space] (Bourdieu, 1990a). Engineering, and specifically defense engineering, are the fields central to this research.

Goffman and a Moral Career/Professional Reputation

To better understand how a defense engineer thinks and acts, I applied Goffman's concept of a moral career. According to Goffman (1961) each moral career, and behind this, each self, occurs within the confines of a total institutional system. The self in this sense is not a property of the person to whom it is attributed, but dwells rather in the pattern of social control that is exerted in connection with the person by himself and those around him. This special kind of institutional arrangement does not so much support the self as constitute it. Also that every institution captures time and interests of its members and becomes [somewhat of] a world for them. I will also further discuss the applicability of total institution to defense contractors in next sub section.

Goffman (1961) describes one's moral career as involving a standard sequence of changes in one's way of conceiving of [or constructing] one's own self and the selves of others. Also that each self occurs within the personal and professional relationships brought about by one's place of work. The self can then be seen as something that resides in the arrangements prevailing in a social system for its members. Therefore, one's place of work helps create one's self.

According to Goffman (1961), a moral career is about one's professional reputation with moral overtones. The way to develop this reputation, or honor is through a series of dispositions that emphasizes one's duty and execution of that duty. Doing one's duty is therefore means conforming to the social order by respecting rhythms, keeping pace, not falling out of line; as a way of reasserting solidarity, and in a way conformity or standing with others (Bourdieu, 1977, p. 161). A worthy engineer is therefore defined as one who possesses a sense of conscientiousness of his responsibility. Goffman (1961) provides a list of experiences one may

go through to come to an understanding of their moral career. These experiences are listed in Figure 4 (see Figure 4).

Experiences that can lead to an understanding of one's moral career/professional reputation:

1. That one needs to reach out for the help of others in getting work done and that this shared work is for mutual benefits.
2. Some work may be considered "unjust deprivation." This is the mundane, non-value added, time wasting, and personally humiliating work.
3. One's role should be complementary to others on the team.
4. One may not be able to complete all and this may lead to feelings of guilt.
5. One's recognized-self rises through the view one constructs when looking backwards over one's progress (creation of the peculiarly retroactive character).
6. One may be deserted, abandoned, or sacrificed by one's coworkers (the idea of letting go of bad or divergent personal bonds and creating new bonds as one moves on).
7. One cannot hide too much about oneself from others in the system and that one's work history is often revealed to others when successful outcomes are re-used and one's advice is sought, or on the other side, when others have to clean up one's past mistakes and marginal work. Plus, there is talk and gossip in the system.
8. Cycles of alienation and mortification (humiliation) allow for new sets of beliefs and opportunities to reconceive a self.

Figure 4. Experiences that can lead to an understanding of one's moral career/professional Reputation

Total Institution. I also looked at the working conditions of a defense engineer to see if defense companies are "total institutions". It is necessary to do this evaluation since our customers (the Army, Navy, Marines, and Air Force) are typical total institution and may attempt to transfer total-institution controls and behaviors to the defense industry. Goffman describes a total institution as have specific key features of a totalitarian social system and can be clustered in five rough groupings:

- First, there are institutions established to care for persons thought to be both incapable and harmless; these are the homes for the blind, the aged, the orphaned, and the indigent.

- Second, there are places established to care for persons thought to be at once incapable of looking after themselves and a threat to the community, albeit an unintended one: TB sanatoriums, mental hospitals, and leprosarium.

- Third, another type of total institution is organized to protect the community against what are thought to be intentional dangers to it; here the welfare of the persons thus sequestered is not the immediate issue. Examples are: Jails, penitentiaries, POW camps, and concentration camps.

- Fourth, we find institutions purportedly established the better to pursue some technical task and justifying themselves only on these instrumental grounds: Army barracks, ships, boarding schools, work camps, colonial compounds, large mansions from the point of view of those who live in the servants' quarters, and so forth.

- Finally, there are those establishments designed as retreats from the world or as training stations for the religious: Abbeys, monasteries, convents, and other cloisters.

According to Foster (2014), the central feature of total institutions can be described as a breakdown of the kinds of barriers ordinarily separating the sleep, play, and work aspects of our lives. First, all aspects of life are conducted in the same place and under the same single authority. Second, each phase of the member's daily activity will be carried out in the immediate company of a large batch of others, all of whom are treated alike and required to do the same thing together. Third, all phases of the day's activities are tightly scheduled, with one activity leading at a prearranged time into the next, the whole circle of activities being imposed from above through a system of explicit formal rulings and a body of officials. Finally, the contents of the various enforced activities are brought together as parts of a single overall rational plan purportedly designed to fulfill the official aims of the institution.

Individually, these totalistic features are also in places other than total institutions. Increasingly, for example, our large commercial, industrial and educational establishments provide cafeterias, minor services, and off-hour recreation for their members. But while this is a tendency in the direction of total institutions, participation remains voluntary.

Another key feature of total institutions can be a significant split between those with highly prized responsibilities and privileges and the various sets of others. For example, management has significant privileges that an engineer may not have. These privileges may include freedom of movement, access to more information, decision making, and ability to interact with the greater world.

There are many aspects of total institutions that apply to defense companies. All defense business locations have security guards, locked doors, cameras, and access control to not only keep non-employees out but these same systems may also be used to track and monitor employee activities. Employees are expected to wear their identity badges at all times and use these badges to get into various parts of the building including their work areas. In most cases, these engineers work in small cubicles the size of a prison cell. There are various regimented behaviors in the system including the tracking of engineering hours to charge numbers associated with respective projects. Employees and their managers also have to sign and approve these time charges. If an employee has more than expected indirect charge (unbillable time), that employee may have to provide written rationale.

Defense companies also have written protocol for every possible contingency. The work is also regimented, tightly-scheduled, and structured, through the use of project plans, procedures, and policies. The tracking of project progress is conducted at various levels through project meetings and an automated earned value management system, a system designed to track and report anomalous/unplanned spending.

However, there are also aspects of the business that do not align with total institutions. For example, most defense engineers have the freedom and choice to separate their sleep, play and work environments. They may work in teams and are fully influenced by the teams pace,

each team member is assigned a specific and special responsibility (i.e., they don't all do the same work). Also, a defense engineer can outright quit whenever they want regardless of project status or incompletion. Defense engineers are paid positions and are usually afforded flexible time to come and do their work; increasingly, more and more defense engineers also telecommute. I will continue my discussion of total institutional and look at it from individual perspective rather than at institutional level.

Professional Reputation – A Synthesis

In this section I will attempt to weave Bourdieu (1977), Flyvbjerg (2008), and Goffman (1961) to create a synthesis of a professional reputation and apply that to this case study. I will start by defining what I mean by a professional reputation, then identify a few guiding principles, and list a few pitfalls one may encounter. Though I am discussing professional reputation in defense engineering, my larger goal is to leverage professional reputation as a foundation for rising above and transcending beyond one's career. This transcending is part of a moral component that both Flyvbjerg and Goffman reference to in discussing the context or work and other social activities.

Recalling that a moral career is about one's professional reputation with moral overtones and it involves a sequence of changes in one's way of conceiving of [or constructing] one's own self and the selves of others in a total institution (Goffman 1961), I would like to propose the use of "professional reputation" instead of moral career. I believe the two terms are interchangeable and the "moral overtones" modifier unnecessary since all institutional stimuli lead to the decision of right and wrong action. Likewise, an absolute "total institution" environment is unnecessary to construct a moral career since "partially" total institutions, like the many defense industry business units, create the same set of experiences as stated in Figure 4 (see Figure 4). According

to Goffman (1961), one's professional reputation is a process of generating meaningfulness, realization, discovery, and understanding of oneself, one's environment, and one's opportunities. In a way, this is generating knowledge through practice.

According to Bourdieu (1997) the way to develop this reputation, or honor is through a series of dispositions that emphasizes one's duty and execution of that duty; also that Personal growth comes from the accumulation of cultural capital and the dialectical interaction between the individual agent's *habitus* and the contextual environment (field). Flyvbjerg (2008) leverages the Dreyfus and Dreyfus Model of Human Learning Process to say that one professional reputation increases as they move up levels from novice, advanced beginner, competent performer, proficient performer, to expert.

Three recommendations that are common to Bourdieu (1977), Flyvbjerg (2008), and Goffman (1961) are: Use rules, procedures, methods, and process judiciously; develop reflective practice; and develop conscientiousness. The use of process and procedures are common to the field of defense engineering and one cannot militantly apply these to everything without understanding applicability. Though Goffman (1961) writes about the process as a means to destroy the old self and create a new self, once a new self is created, one becomes more aware of processes and process malleability.

> Intuition and judgment cannot be externalized into rules and explanations. Experts add judgment, practice, trial and error, experience, common sense, intuition, and bodily sensation to analysis and rationality to reach decisions. According to Flyvbjerg (2008), Rational or rules based thinking generally constitutes an obstacle to good results, not because rules and rationality are problematic in themselves, but because the rational perspective has to be elevated from being necessary to being sufficient, even exclusive. This has caused people to become blind to context, experience, and intuition, even though these phenomena and ways of being are at least as important and necessary for good results as are analysis, rationality, and rules. (Flyvbjerg, 2008, p. 24).

> There is a right way and a right moment to apply rules. (Bourdieu, 1977, p.20).

The development of a professional reputation also requires reflection and reflective practice (Learning from one's experience) to generate new meanings. This practice is learning about oneself and one's work and developing the capacity to reflect on action so as to engage in a process of continuous learning. It involves paying critical attention to the practical values and theories which inform everyday actions. Reflective practice leads to development of insight and informed ethical practice.

> One's recognized-self rises through the view one constructs when looking backwards over one's progress (creation of the peculiarly retroactive character). (Goffman, 1961, p. 145).

> … the transformation of the generative schemes is doubtless reinforced and accelerated by the dialectic between the schemes immanent in practice and the norms produced by reflection on practice, which imposes new meanings on them by reference to alien (or new) structures. (Bourdieu, 1990b, p. 57).

> The reflection of *habitus* is what enables the attaining of realization. And that it may take a long time and intentional effort to achieve this. (Bourdieu, 1990b, p. 57).

> Intuition (and not application of rules) as the ability to draw directly upon one's own experience to recognize the similarities between that experience and the new situation. (Flyvbjerg, 2008, p. 21).

> …. Rationality may endanger sensitivity to context, experience, and intuition. (Flyvbjerg, 2008, p. 24).

Another connection between the three authors is the development of conscientiousness (knowing right from wrong) as one progresses professional reputation. According to Flyvbjerg (2008), an expert aims for ethical behavior though conscientiousness and *phronesis* [practical wisdom]. The way to develop this reputation, or honor is through a series of dispositions that emphasizes one's duty and execution of that duty.

> An expert … operates from tacit skills which are skills that are characterized by the highest level of the learning process. …..and commonly called practical consciousness. (Flyvbjerg, 2008, p. 35).

> Doing one's duty… therefore means conforming to the social order by respecting rhythms, keeping pace, not falling out of line; as a way of reasserting solidarity, and in a way conformity or standing with others. (Bourdieu, 1977, p. 161).

CHAPTER 2: METHODOLOGY

> Just as the methods we choose influence what we see, what we bring to the study also influences what we *can* see.
> - Kathy Charmaz (2009)

In this chapter I will describe the methodology used in my case study. This study combined two methods to weave a more comprehensive picture of the situation and also to provide a just and fair representation of the stakeholders. I used case-study methodology in tandem with a grounded theory approach for data collection and analysis. I believe these two methods allow for the best complements of strengths and limitations (Yin, 2009). In the next two sections I will discuss my reasons for selecting these two methods.

Case Study

According to Yin (2009), the case study is used in many situations to contribute to our knowledge of individual, group, organizational, social, political, and related phenomena. Therefore, I will investigate the complex relationship between ACME North and ACME South and identify the various elements that have adversely impacted their relationship including history, personnel, organization structure and leadership. The scope of this study is to examine and develop a thorough understanding of one or two elements that are represented in the data. The case study methodology is best suited since it provided an in-depth understanding of the relationship and that it is conducive to multiple sources such as interviews, observations, and other business artifacts (Plank Clark, & Creswell, 2007).

As I investigated the discordant relationship between the two business units, I encountered two individuals with exemplary selflessness, ability to navigate the murky moral path, and despite their right actions and good outcome, they are neither recognized nor rewarded. They are my unsung heroes in this system and are called hero engineers.

However, these hero engineers would be one-dimensional if not placed in the context of their environment. Therefore, this study also provides information on the two business units, their history, and the overall leadership/management as a framework for these hero engineers.

As mentioned, I looked at two representative projects between the two business units. The first project was the transition of medium-caliber naval gun called Catapult (a pseudonym) production from ACME North to ACME South. In this case, since management was not allowed to bring the repair business from ACME South to ACME North, they decided to send the production of Catapult to ACME South. The result was a rough transition from highly capable production line that was run for over 20 years to a new line fraught with unanticipated issues with productivity, schedule, and cost. More capability had to be added to ACME South to compensate for this debacle. The second project called Reverse Colonize (a pseudonym) was to move the technical publication group, responsible for development of product technical manuals, from ACME North to ACME South. This project immediately ran into problems because they did not have the right mix of domain experts at ACME South. Both these project required the dismantling of capabilities at ACME North and setup/startup of capabilities at ACME South. These projects are further described in the Chapter 5.

Strengths and limitations of case research

Case studies are best when used on "how" or "why" in investigations (Yin, 2009). A common concern about case studies is that they provide little bases for scientific generalization (from a single case). As stated by Yin (2009), [a single case] does not represent a "sample" conducive to statistical generalizations but to expand and generalize theories or analytical generalization.

As an engineer I have significant background in technical or natural science methodologies. However, the qualitative nature of this study would be better served by Flyvbjerg's (2008) social science methodologies and Bourdieu's (1990a) *habitus* and field to unearth the characteristics of the hero engineers, the nature of their environment and to better understand the power in the system.

Grounded Theory

I used grounded theory for data collection, coding, and analysis. I have been aware of the relationship issues between the two business units for many years and this experience will help in collecting rich and relevant data. As mentioned before, I hope to discover certain generalized understanding of not only the relationship between the two business units but also the working of the defense industry as a whole. I am also interested in the participants as a group and therefore, application of grounded theory would be ideal (Plank Clark & Creswell, 2007. p. 63). I used grounded theory coding methods to conduct data analysis and develop a conditional matrix as a coding device to allow me to make connections between micro and macro conditions of the case.

Applying generalizations. It was my not my direct intent to generalize the findings in this study to all inter-corporate relationships in the defense industry. My research focused on ACME; however, the conditions influencing the relationship between ACME North and ACME South are common to the whole industry and therefore, it is likely others are facing similar issues. Flyvbjerg (2008) warns us not to discount the generalizability of the findings since it is appropriate to consider this an exploratory study that could be augmented by additional studies. He also says that formal generalizations are but one of many hypothetico-deductive models and applicability is based on the researcher possessing a wide range of practical skills for carrying

out the study. Simply, formal generalization is one of many ways which people create and accumulate knowledge and that knowledge which cannot be formally generalized does not mean that it cannot enter into the collective process of knowledge accumulation.

Additionally, the narratives revealed the natural and results of science methods that were implemented to improving the conditions between the two business units. For instance, it is very likely that management looked at the relationship between the business units with a natural science perspective that the clinical nature of any issues would be (quickly) resolved by technological and scientific methods. This case captured these events and methods for evaluation of their respective successes. The initial result was chaos in the system. It took many years of fine-tuning and reorganizing to achieve a working balance.

Data Source

Demographics. This section provides the demographic details of the participants. I interviewed managers and engineers with relevant knowledge of the case. The managers and engineers were selected from various levels of responsibility and experiences based on their involvement with both ACME North and ACME South. The selection method will be based on snowball sampling (Nardi, 2006). Table 4 (see Table 4) provides further details of their makeup.

Consent form and confidentiality. All participants were volunteers and provided willful consent to participate. Participants signed two consent forms; one for their keep and the other for my files. I interviewed the personnel listed in Table 4.

Table 4. Demographic data

	Name	**Title/Description**
1	Mark M	Catapult Program Engineering Manager and Navy Program Logistics Manager. Over 40 years of experience at ACME North. Responsible for the development and production of the Catapult gun. One time manager of the engineering group at ACME South. Has work ongoing in both locations. Most knowledgeable about both locations.
2	Jason A	Director of Product Design. Has more than 200 engineers in his group in locations throughout the U.S. Over 27 years of experience at ACME North.
3	David L	Functional manager for electrical and mechanical engineers. Over 30 years of experience at ACME North. Does not have any relationship to ACME South but helps his manager Jason A manage engineering utilization.
4	Barry O	New manager assigned to find work for ACME South engineers. Over 25 years of experience at ACME North where his office is located. Reports to Jason A.
5	Mel G	Former engineering lead for ACME South. Has over 15 years of experience at ACME North and has worked at ACME South for over 17 years. He was the middle person between the two business units. He has provided management, direction, and guidance to ACME South engineers.

My involvement as a participant-observer is a privilege. I followed the University of St. Thomas Institutional Review Board (IRB) guidelines using pseudonyms and confidential agreements at all times. To maintain company confidentiality and sensitive business information, I only shared data with my advisor. I did not plan to provide participants with their interview transcription unless they show an interest. There were no payments for participation.

In some cases, more than one interview was conducted to clarify and add more details. All interviews in were conducted face-to-face.

Guiding research questions. These draft questions were developed to elicit the condition of the relationship between the two business units. However, in order not to lead the participants during the interview and to provide for good triangulation and validity the questions will focus on each participant's knowledge of the history, views on the ongoing projects, and opinions on what was working and what was not working. These interviews were conducted in the style called "the interview conversation" where the in-depth nature of an intensive interview fosters eliciting each participant's interpretation of his or her experience (Charmaz, 2009). I plan to conduct at least one interview per interviewee. These guiding questions include:

1. What is your title and role at ACME?
2. What projects are you working on and please describe the work you are doing?
3. What is the history of ACME North/ACME South as a business entity?
4. How is work and management directions shared between the two business units?
5. Could you describe the relationship?
6. What are the things that work between the business units and things that do not seem to work?
7. What changes would you like to see in the future?

These questions were intended as initial premise to start a more wide-ranging and in-depth conversations. Since participants come from various levels of knowledge, not all questions may be pertinent to everyone.

Data collection Strategy. Interviews were recorded on digital recorder and then transcribed. I used real names during interviews and to change to pseudonyms during the process of

transcribing. The recorded data resided on compact disks lock-stored at my home and all recordings were destroyed upon completion of this case study. ACME management was not provided access to these recordings and is not interested in this data. I also used various publically released data from ACME to provide a rich history of the two business units.

I initially focused on the two projects under study. Based on data analysis, the behavior of two individuals in the system became more the prominent subject and therefore I switched to the capture of their *phronetic* behaviors and the ongoing ACME North and ACME South dynamics that is conducive to *phronesis*.

I also generated field notes on the various subject including my personal experience at ACME North, my trips to ACME South, various thoughts and emotions on the subjects that were brought up during interviews. A sample of these field notes are provided later in this chapter.

Data processing. As mentioned before, I used grounded theory methods established by Charmaz (2009) to capture rich data through personal observations, intensive interviews, memo writing, and qualitative coding. I used qualitative coding, the process of defining what the data are about as the first analytic interpretation or step. This method of coding, that fosters the study of actions and processes, worked extremely well for this case study since it illuminated the action and methods employed by ACME and the two business units.

The method of initial coding, focused coding, and axial coding (connecting themes) allowed for the systematic conversion of raw data to analysis. The initial coding focused on events, incidents and actions of the business, managers, and workers. The line-by-line coding method (Charmaz, 2009) for quick and spontaneous initial coding allowed me to remain close to the data. In some cases, I used in-vivo codes to maintain the meanings and actions conveyed by specific participants (Charmaz, 2009).

In focused coding, the second major stage of coding, I used analytical directions to synthesize and explain larger segments of the data. At this stage, I identified the more relevant and significant codes (or themes) that provided inclusive and comprehensive analytical sense. Likewise, in some cases the axial coding allowed me to relate categories and sub categories by fracturing the data and re-assembling into new ways (Charmaz, 2009).

Data Analysis. Data analysis on the ACME North and ACME South relationship was conducted by developing a conditional matrix. Since it was my intent to describe the two projects, the conditional matrix provided a skeleton timeline to which I was able to "hook" the relevant pieces of data and then weave results into a cohesive narrative. A database was used to manage the re-assembled pieces of data. For professional reputations, I used a similar approach using another conditional matrix.

I applied Charmaz (2009), Flyvbjerg (2008), Bourdieu (1977, 1984, 1990a and 1990b), and Goffman (1959 and 1961) to understand power dynamics, apply *phronesis* (practical wisdom), and describe the makings of professional reputations.

Maintaining ethical standards. I adhered to the University of St. Thomas' Institutional Review Board (IRB) requirements and discussed my ethical issues with my advisor. Since this subject is directly related to my work, and I intend to be a member of ACME for the foreseeable future, I have the necessary prolonged engagement in the subject under study. My intention was to do no harm to the participants or to the organizations.

Field Notes

I generated numerous field notes during this case study. Many of them were to capture my initial analysis of the situation and to make sense of what I was discovering. I've included a few field notes in this section.

ACME North. ACME North is an impressive building. It has roughly two million square feet of space under a single roof. This is one of the largest buildings in our state. Originally, there were numerous separate buildings. A few years after construction, a single roof was added to cover all the buildings into one to ensure uninterrupted work during our harsh Midwest winters. The plant is surrounded by open space and parking lots. There are few windows in the building and most of the office space is located in the inner parts of the building; therefore, it is often that I do not see the sun at all during my work hours. The building also has a worn-out look but I have grown to tolerate the conditions due to the significant history of our building.

The plant is laid out like a city. It has named "roads" and locations. For example, the main two north-south arteries in the building are called Central Ave (a pseudonym) and Blackstone Ave (a pseudonym). There are also numbered roads, running east-west, and address posts throughout the plant; for example, a delivery to 34 Ave 10 W would mean deliver to post marked "10" on the west side of Central Ave on 34th Ave. The arteries and some avenues are capable of semi-truck traffic in order to facilitate the transport of large products. There are industrial carts, fork trucks, bicycles, and pedestrian traffic throughout the building; with each having rules to provide safe movement of product and people. People traffic is only allowed within the confines of a four-foot marking on the roads. To ensure safety, all employees are empowered in the care-taking of others and can challenge inappropriate and dangerous behavior.

All personnel must have a valid badge to enter the premises. The badges come in various colors to denote levels of access. All visitors must have a valid business reason to be granted entry by ACME North Security. These visitors must be escorted at all times by employees.

Most engineers work in their designated cubicle offices. These "cubes" are made up of prefabricated walls that are 9 x 9 feet and 6 feet tall with one opening for entry/egress. There is

some sense of privacy but other around you can easily hear your phone calls and conversations. Each engineer is assigned one or more computers in the cube depending whether one needs a desktop as well as a workstation to do engineering. Most cubes are sparse with two desks and two chairs. The second chair is usually for other engineers during technical discussions or personal visits. Managers are provided a walled office that provides more privacy. I work in a manager's office. Groups are engineering and management offices are scattered all over the building rather than grouped into one area.

There is a central cafeteria that opens for breakfast and lunch where hot meals, sandwiches, salads and soups are made available for sale. The company provides free coffee and it seems like engineers drink a lot of coffee. Most engineers work from seven AM to four-thirty PM with 30 minutes for lunch. This is called a 9/80 work schedule where one works a total of 80 hours in 9 work-days; this allows for an off-Friday every two weeks. I like this schedule better than the 40 hours every week. Occasionally, I have to put in extra time at work. Engineering is considered a professional career and therefore overtime pay, unless authorized by management, is not provided.

Most engineers are given an assignment and schedule to meet. There is considerable discourse in engineering to ensure that the design is right and that it will work as intended. Designs may be peer-reviewed and/or stakeholder-reviewed. At a peer review, usually conducted on software code and drawings, a few other engineers will give you feedback on issues; there usually is no brainstorming for solution. At a stakeholder review, the document or drawing will be reviewed with management, customers, and other subject matter experts with discussions and brainstorming of solutions. The product design is conducted in accordance with the general development process provided in Chapter 1, Section 2.

ACME South. ACME South has the same building structures but without the single roof because the weather conditions in the south are not as drastic. Since the ages of the buildings are the same as the ones at ACME North, it also has a very old and worn out look typical of the plants that were built during World War II. Engineers work in cubes similar to the ones at ACME North. They also require security identification badges to enter the premises. One main difference is that the engineering cubes and offices are collocated into one building, which turns out to be the furthest building from the production area, making it a chore to get to the other working parts of the factory. The overall feel is a sense of sparseness similar to ACME North since there is an abundance of unused space that seems to dwarf the actual amount of work being carried. The ACME South engineers work the same 9/80 schedule and share common processes and procedures with ACME North.

Hero Engineer Mark M. I have known Mark M for over 22 years. He has over 33 years of experience at ACME North and has been the Catapult Program Manager ever since I have known him. He has a mechanical engineering degree from the Milwaukee School of Engineering and a Masters of Business degree from the University of Minnesota. He is very detailed oriented and tends to worry about everything, sometime to a fault. Extremely intelligent and hard-working, he is also very tenacious and usually gets things his way by raising major issues and presenting his case. He likes to vocalize his ideas and loves a good discussion. He is passionate about his job and is probably a workaholic because he spends a lot of time at work and then goes home and works from home. He is a very nice guy once you get to know him. He is considered demanding by some, but he is consistent in this behavior. He is detail oriented and makes thought-through decisions. He is married and has one adult daughter. He often has a very concerned look about him and a frantic disposition.

To show his nature and his commitment to work, he told me how much he enjoys fishing and boating and puts his boat on a local lake every summer. However, due to his work habits, he ends up being on the boat no more than four times a year; often only when he puts the boat to water in late spring and when he pulls it out for dry docking in the fall. He is trim and looks at least 10 years younger than his age. He wears fashionable designer clothes and when asked, he tells us that he wears anything his wife purchases for him. He exercises and eats right since there is always fruit in his office, and he brings packed lunches. He has 10 lower level manager reports and has control over 70 engineering and support personnel.

Hero Engineer Mel G. Mel G is a senior level engineer and was working at ACME North when I started in 1992. However, we worked on different project, and our paths did not cross until I interviewed him for this case study. He has an excellent reputation with other senior level engineers that I closely work with. He was born in Iowa and worked for CMC in Iowa City before moving to ACME North in 1985. He spent 15 years at ACME North, and then moved to ACME South where he has been for the last 18 years. He is about 59 years old. He is very heavy set and with a slight beard.

He has a shy demeanor and a soft-spoken voice. He is usually dressed in chinos and dress shirt. He has a kind face and a very inviting disposition but considers himself to be a loner. He moved his family to the South when he took a job at ACME South and loves living in the south since he never adjusted to the very cold weather in the north. He once told me that cold weather was a waste of time. He is an avid golfer and loves to watch sports on television. He volunteers as a coach at high-school level robotics competitions.

CHAPTER 3: HISTORY OF ACME

History of ACME North

In this chapter, I will summarize the history of the two ACME business units. I will also show that the relationship between the two business units goes all the way back to 1941. ACME North has a very rich history in the Midwest region of U.S.A. In 1924, John Blackstock (a pseudonym) joined the Midwest Pump Company as a civil engineer. Born in Texas and with a degree in civil engineering from Cornell (1921), he had come to the Midwest to join up with Food Company Inc. A few years later, he joined up with Midwest Pump Company (a pseudonym). Midwest Pump was a very small company with about 50 employees that sold water pump equipment for firefighting. He was brash, creative, and was always thinking about improvements to existing systems. In 1928, he sold an invention to Midwest Pump for a controlling interest in the company and became the company's president. In 1932, Blackstock landed a contract to manufacture submersible pumps and other hydraulic equipment for the U.S. Navy. Midwest Pump started to grow and took on more employees.

In 1940, the U.S. government started a massive rearmament program in anticipation of engagement since most of Europe was already at war. Blackstock convinced the Navy to give him the contract for building anti-aircraft guns. He thought that the Midwest region was perfect for the job since there were many highly skilled machinists in the vicinity. To do the work, Blackstock purchased a 350-acre site (Kenny, 2005) to build a giant factory. He even had his own private airport adjacent to the plant and created a wholly incorporated business called Midwest Ordnance to fulfill government contracts. The initial set of buildings was constructed in just over two months. Figure 5 (see Figure 5) shows some of the hardware produced by the Midwest Pump Company, predecessor of ACME North.

In 1941, parts of the factory were converted to a Government Owned, Contractor Operated (GOCO) facility. As a GOCO facility, the property was owned by the government and operated by Midwest Ordnance; therefore, there was joint ownership of the whole factory. By this time, the location had around 4,000 employees.

The Navy was very happy with the work and awarded Blackstock additional contracts for manufacturing large-caliber navy guns. These life-time relationships that Blackstock established with the U.S. Navy still plays a significant role, and ACME North continues to be the go-to place for U.S. Naval guns and other weapon systems. At the height of the war in 1943, total employment at the plant was over 11,000.

That same year, the company received its first Navy "E" - an award for excellence, and went on to earn five more "E" awards in the ensuing years. The Navy "E" and five stars painted on its smokestack stand as testament to those early honors and remind the employees of their past work performance and dedication to the U.S. Navy. This factory is one of eight in the nation given this maximum number of six excellence awards. The Navy "E" awards were only granted during World War II.

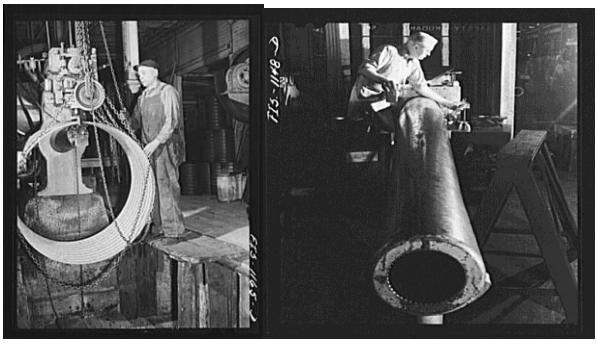

Figure 5. Large components being prepared for assembly in 1942 (Library of congress, 2014)

The atmosphere was typical of what you would find at a skunk-work in conjunction with efficient, state-of-the-art manufacturing. Innovation and creativity were highly regarded and rewarded. This environment attracted many mavericks and tinkerers that were similar to Blackstock. In

reflection, the successful and highly-regarded managers have all been cocky, brassy, and larger-than-life types.

The main workforce was made-up of engineers and machinists. However, the focus was to hire the very best and brightest that management could find. Groups of engineers were structured around their functional discipline but assigned to specific project where they could contribute and learn from senior engineers. Mentorship was expected and provided with long-term personal and business growth in mind.

The plant continued to produce guns for the U.S. Navy after the war and moved on to other weapon systems. In 1964, Blackstock sold the company to a conglomerate called Chemical Machinery Company (CMC) (a pseudonym). CMC also purchased other defense companies and combined them into a defense business sector. Though CMC's main interest was in industrial chemicals, it saw the opportunity to increase profit and cash flow by purchasing small defense companies and pooling them into a cohesive group. This combining led to more work including U.S. Army development projects. In 1994, CMC pooled its entire defense group and merged it with Barsco's BMY defense holding to create a joint subsidiary called United Industries (a pseudonym).

History of ACME South

During this research, I was surprised to learn that ACME South was constructed in 1941 and was designed to be very similar to the ACME North. In a way, it was logical to set-up the two locations in unison since one was going to build the naval guns and the other was going to do all the repair, maintenance, and overhaul of the guns that were to be built at ACME North. These were twin plants – one in the North and the other in the South. Figure 6 (see Figure 6) shows the depiction of the ACME South plant in 1987.

> ACME South is the same age as the ACME North plant, from the beginning of WWII. Both the plants look exactly the same in layout and everything except everything is under one roof at ACME North so that the weather does not interfere with the work. The ACME South plant was actually added on more building than the ACME North plant. They had over 500 employees at one time with three shifts. ACME South took on a lot of different things. Most of it was overhaul, new gun barrel production, etc. (Mel G, Personal Interview, 2011).

When war broke out in Europe in September 1939, a national emergency was declared and the defense department pressed for additional ordnance production factories. In July 1940, Congress appropriated monies, and the defense department researched over two hundred sites that offered the advantages of inland location, adequate labor supply, and good transportation connections. Naval Ordnance Station (a pseudonym) (NOS), later to become ACME South, was one of five sites selected for the location of an inland Naval facility (Furer, 1959). This was a strategic call by the Navy, and not the championing of any one individual to place this facility inland rather than on the coast to protect repair and refurbishing capabilities.

NOS was built on 142 acres with a total 1.5 million square feet of building space. The factory was commissioned as a Naval Shore Establishment to provide shore support for operating forces. The factory was contracted to Westinghouse Electric Corporation and mainly served as a repair depot. At its peak, NOS employed about 4,200 employees working on navy equipment, including the guns built at ACME North.

NOS was the epicenter of U.S. Naval gun repair. During World War II, U.S. Navy fire power increased by ten-fold and caused significant demand for gun parts, repairs, and refurbishing. The Westinghouse contract expired in 1946, and NOS went back to Navy control. By this time, employment had reduced to approximately 500, and these employees were converted to civil service status (instead of remaining service Navy personnel). During the

Korean War, employment did go up to 1,800 but again, was considerably reduced after the Korean and Vietnam wars.

By the 1990s, NOS was the only surviving factory that provided overhauling, engineering, and support services to the U.S. Navy's surface weapons systems including some anti-ship missile defense systems. Further reductions took place post-Cold War. In 1993, due to access capacity and underutilization, NOS because an ideal candidate for Base Reduction and Consolidation (BRAC), a U.S. government program aimed at closing various bases and government owned facilities to reduce costs. NOS survived the cuts but the local city government saw this as a future problem and started building a case for privatizing and not outright closing it down. This would allow employees to remain and would remove the burden from the Navy and continue to be a viable presence in the local community. If NOS was closed down, the community stood to lose over 1,200 jobs (NSOL and city support).

Figure 6. Example of Naval Ordnance Station Plant

Unlike Blackstock from ACME North, there is no evidence that there was any one single individual that created and championed NOS. After the NOS was placed back into Navy management in 1946, it was led by a string of Navy captains. By all accounts, these were competent leaders assigned to a shore command that typically lasted three years. After the three years, they were re-assigned to other leadership positions in the U.S. Navy. These shore commands were barely tolerated by these captains and not welcome since time-on-water offers more leadership training and keeps one on-track for advancement. Only five internal employee newsletters are available for public review between September 1973 and January 1992; these newsletters show at least five different base commanders within this 19-year period. Typical shore assignments last about 3 years; this is insufficient time to develop, implement, and see the results of leadership application. This could possibly mean the civilian managers below the captains were the leaders of NOS and guided the business through the good and the rough times.

Using defense industry terminology, NOS falls under "sustaining" (or supporting role) rather than "creating" (or new product development) that is the ACME North environment. In both ACME North and ACME South cases the work determined the behavior. ACME North developed a more "skunk works" mentality with innovation, speed, and highly skilled machinist working hand in hand with engineers with the goal to be creative, develop new products, grow the business, and make profit. ACME South (or NOS) was run as a repair depot (low tech) with set processes and procedures that required a by-the-book mentality. NOS's goal was to meet the U.S. Navy's needs in repair and refurbishment of established weapons regardless of profit, cost, and schedule.

Though NOS was a Navy base, most employees were civilian and made-up of tradesmen like machinists and technicians; there were a few engineers. Their main task was to repair and

refurbish existing navy weapons including guns and short-range missile launchers. This type of work required methodical and by-the-book temperament. These workers were the maintainers and technicians, and not the engineers or creators of products. Another factor to consider is that in some cases they were repairing equipment that was over 30-years old and often one or two generation-old technology.

Common History between ACME North and ACME South

The two business units have worked together since 1941 but have always had an acrimonious and competitive relationship even when they were under different ownership. Field and repair problems with the ACME North manufactured guns were blamed on ACME North rather than typical wear and tear of the heavily used weapons. Likewise, ACME North workers were convinced that the Navy was wasting money on NOS when ACME North could build and repair the guns at a lower cost.

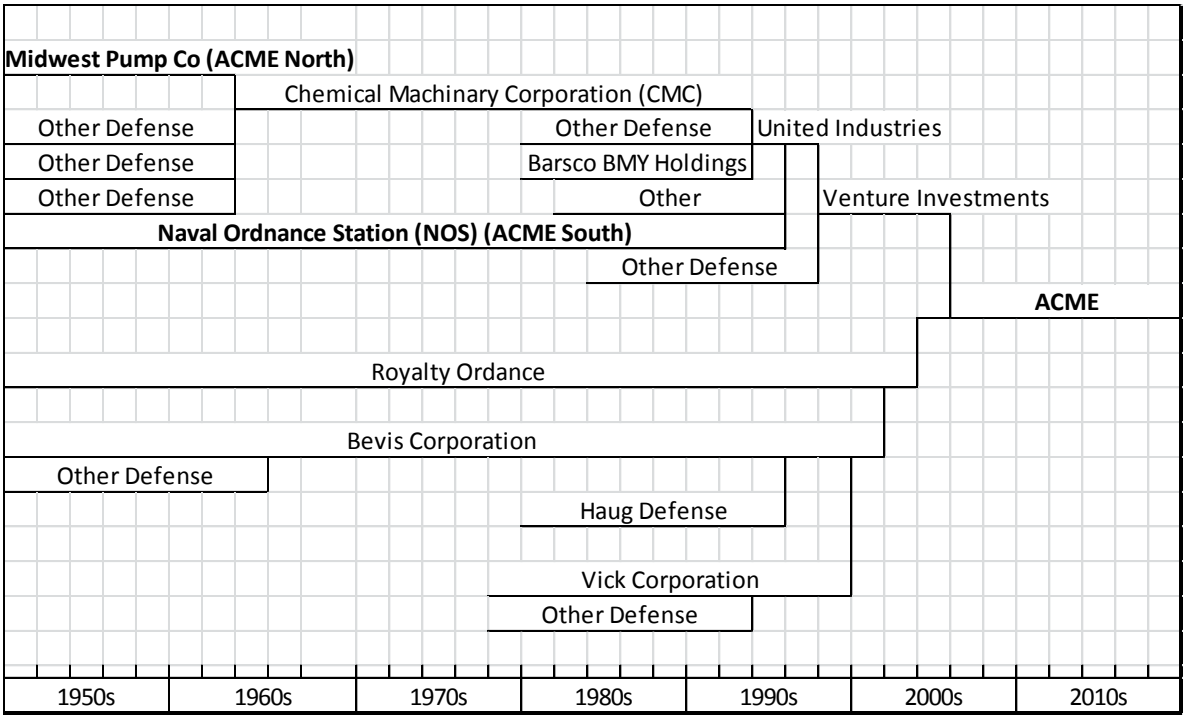

Figure 7. Midwest Pump Co. to ACME Evolution

Figure 7 (see Figure 7) provides a diagrammatic view of the various combinations, purchases, joint-ventures and buyout of AMCE North (Midwest Pump Co.) and ACME South (the former Naval Ordnance Station). As mentioned before, these types of changing corporate relationships are common to the industry. A review of any major defense contractor's pedigree would show a similar diagram.

1985 to 1995: The Post Cold-War Era

The relationship between the two businesses changed around 1985 and became more competitive. This added competition would continue to reverberate even when the business units are united. Things got very problematic for the future ACME South since ACME North aggressively lobbied to shut them down. This would sour the relationship for a very long time and contributed to many issues when the two businesses were combined. The relationship during this era is well documented in a *Naval Law Review* article (Render, 1997).

When the Cold War had ended and the Reagan defense buildup was over, significant cost reductions were implemented. The U.S. was faced with excess military capacity (Render, 1997). There was considerable pressure on the Pentagon from the U.S. government and private industry to reduce defense spending either by conversion (transitioning government owned defense work to private industry) or outright shutting down military bases. Defense contractors lobbied Congress to shut down bases and to develop new products in order to reduce cost-cutting impact on them. The Pentagon knew that many military installations should be closed merely because they were unnecessary to the national defense; however, this was no simple task (Render, 1997).

> Over the years, it became painfully obvious closing military operations was no simple task. Presidents from Nixon to Clinton have been accused of having at least one eye on their domestic political interests when making base closure decisions. Military bases significantly impact the community's

> economy. Not only are military, civilian, and contractor personnel salaries spent in the community, the government installation itself generates a host of other businesses that sell goods and services. Therefore, local business, political, and labor leaders generally do not want such facilities closed or moved. (Render, 1997, p. 245).

ACME North, owned by CMC at that time, lobbied for the U.S. Navy to outright give up its control of NOS to ACME North as part of continued economic conversion from government ownership to privatization. ACME North claimed that not only could it do the work but that it would be done efficiently and with better quality. The U.S. Navy was faced with a dilemma.

> Although the workload at NOS [ACME South] declined in volume during the five years prior to its privatization, the nature of its work remained essential to the national defense effort. Although parts of the work can be completed in many different locations. [ACME South] is a unique Place because no other single location in the United States can completely rebuild Navy guns and missile launchers. In order to rebuild these weapons safely and efficiently, it is necessary for substantially all of the work to be completed at one location having all the required processes and capabilities. The Navy remained unwavering in its position on this point, even after the 1995 round of base closures. The gun repair and missile launcher work done at [ACME South] would be done somewhere. The only question is whether it would be done by federal employees at [ACME South] or at some other government installation; by a private contractor occupying ACME South after transfer to the [city and county] Redevelopment Authority; or by a private contractor's facility at another location. (Render, 1997, p. 254).

In 1991, the U.S. Navy estimated that it would cost $200 million to close NOS as a government installation and hire a private contractor to perform the same work. Washington rejected ACME North's plan and NOS was not placed on the base closure list for 1991.

During the next round of base closures in 1993, NOS was not originally on the DoD's closure list; however, ACME North lobbied hard to close NOS. ACME North felt that it was unfair to have to bid for contracts against NOS since NOS, as a government-run facility, had rates that were subsidized by the American taxpayers and did not reflect "true" costs. Moreover, ACME North argued that the Navy had 100 times the capacity that it needed. ACME North,

therefore, wanted the Navy to shut down NOS and transfer all NOS workload to ACME North. ACME North's campaign failed and NOS survived the 1993 base closure round.

> Naval Ordnance was not originally on the DoD's closure list in 1993. However, [CMC], [ACME South's] gun repair competitor, induced the Commission to place Naval Ordnance on the closure list. An internal [CMC] memo dated March 16, 1993 written by James Orr, a high ranking official in that company, states the company's reasons for wanting to acquire the work currently being done at [ACME South]. He referred to [ACME South] as the "Evil Empire." Orr continued, "It is certainly frustrating and discouraging for [ACME South] to have totally avoided the DoD list .... It is us or them!! The marketplace is not big enough for both of us." This memo also suggests pressuring the Navy as much as possible to close Naval Ordnance. (Render, 1997, p. 256).

In preparation for the next round of base closures in 1995, CMC continued to apply pressure on the U.S. government and the DoD. CMC generated a lot of press by complaining that the government was keeping too much work (Render, 1997). CMC also started discussions with the city and county commissions to convince them that base closure was imminent.

In 1994, the local politicians met with Navy officials in Washington D.C. and, unless something changed, the decision was that NOS would be closed in 1995. The local politicians and business representatives became convinced the best course of action in the 1995 round would be to urge the Navy to permit the privatization of [NOS] (Render, 1997). Rather than fight the forces of closure, they changed their tactics to privatization of NOS.

> However, some NOS employees believe CMC pressured the Navy into closing NOS. They feel the Navy violated the law and internal regulations by "cooking" the data to justify a closure decision and agreeing to privatization so [South City] politicians would not protest too loudly. (Render, 1997, p. 260).

In early 1995, several employees of NOS complained to the Inspector General of the Navy, and an official investigation begun. The investigation found that higher echelon officials

had changed or excluded cost data without justification and supporting documentation (Render, 1997).

In 1995, NOS was again placed on a closure list. However, this time around the city government was prepared to influence the outcome and quickly convinced CMC that it would be beneficial to buy out the whole gun business without a public/private setup. This way, one company would outright own the manufacturing as well as the repair of naval guns. This is a very rare event in the defense industry and is called Privatization-in-Place. In May 1995, South City and South State convinced Congress and the Navy that NOS would be kept viable and active in the community by splitting NOS four ways with parts of it going to CMC (for gun repair), Ray Missile Company (a pseudonym) (for missile systems repair), the Navy, and the city government of South City. This was highly supported by the South State's congressional delegation and everyone saw this as a win-win situation.

On June 1, 1995, the city and county leaders signed a memorandum of agreement with CMC dealing with ACME South. The plan was to have DoD recommend privatization of NOS and transfer the ownership of the land and buildings to the City and County Redevelopment Authority, a non-profit agency.

CMC would be hired as contractors to operate the gun repair and refurbishing. It was expected that many of the employees would be retained and would become CMC employees.

> …. "Privatization" [of ACME South] is nothing short of the federal government making a gift of a unique multi-million dollar factory to the [Redevelopment Authority]. Why should the federal government give away the capability? Why should [South City], as opposed to the entire country, be the beneficiary of this gift? The main beneficiary of the gift could be the defense contractors. Why not sell Naval Ordnance with all of its equipment to the contractors at its fair cash value if they are so anxious to do the work? (Render, 1997, p. 282).

However, when the time came for completing the privatization-in-place, the South City government wanted more concessions, and at the last minute, decided to open up competition for ownership of NOS. According to the city, the buyer had to own the factory, be a leader and contributor in the community, grow the business, add more products, and create jobs. This was more than what ACME was willing to offer but was very concerned that the repair business could end up in the hands of a competitor. Another defense contractor doing the repairs would allow them a foothold into the design and manufacture of future naval guns. To protect turf, ACME reluctantly agreed to the deal. As part of the deal, ACME North was to not compete for any of the work previously allocated to NOS. On completion of the deal, approximately 350 employees transitioned from Navy civilian employees to corporate employees. The station changed names from NOS to ACME South.

1995 to 1996: The Marriage between ACME North and ACME South

ACME Corporate organized for ACME South to be managed by and run through ACME North. Basically, ACME North would replace the Navy leadership and take over the employee-support infrastructure (Human Resource, Security, Safety, etc.). The initial transition was difficult, and the company struggled to increase productivity and to add additional employees per the agreement. ACME decided that it would faithfully meet all terms of the agreement. The business hired about 30 engineering employees that would become the ACME South design and engineering team. Unfortunately, they were hired without any workload or assignments. This led to many of them showing -up without any work to do.

Though the productivity of ACME South continued to increase with use of new processes and procedures on the repair side of the business, engineering utilization suffered. “Utilization” is the percentage of charges to a direct Navy contract or commonly called direct-charge. A

defense company can only bill the government for direct-charges. For example, if an engineer works 100 hours and charges 80 hours to a direct charge number, and 20 hours to training and vacation, utilization is 80%.

In order to make sure these newly hired ACME South engineers had work, project and program managers at ACME North were tasked to send their on-going work to these new engineers. Unfortunately, ACME South had the wrong mix of engineers; where the ACME North projects needed experienced engineers with specific and specialized product development skills, majority of these newly hired engineers were inexperienced and had general instead of specific skills. This was not the problem of the engineers hired; it seems ACME South managers hired the skills typified by past work, of repair and sustainment, rather than the new responsibility of product development.

The employees at ACME North were concerned that management wanted to send their work to ACME South and would often simply ignore top management's request to re-assign work. Additionally, it took more management time and skill to break-up work between multiple business units. The responsibility of running the ACME South plant was transitioning properly but the work was not moving to ACME South as quickly as desired by management. To accelerate this move of engineering work to ACME South, management took a drastic action to reduce head count at ACME North and about 20 engineers were laid-off. They were laid-off even though there was sufficient backlog of engineering hours and high utilization. These management decisions did not help with the already contentious relationship between the two engineering communities. The engineers and managers felt punished for not sending work to ACME South.

ACME South was the first such privatization-in-place. On August 19, 1996, the location was officially turned over to CMC. New CMC management from ACME North was installed at ACME South. This was a very difficult and acrimonious transition; many leaders from the U.S. Navy, U.S. Congress, state, and city leaders were in attendance at the transition ceremony to convey the importance of the location to the local community and the U.S. Navy. The city leaders clearly also wanted to demonstrate to CMC its commitment to the continuation of ACME South. Here are some comments extracted from speeches to demonstrate their continued support of the ACME South (CMC Employee Newsletter, 1996).

> One of the constants that has followed this facility through its 55 years has been change. The mission has changed time and time again and the economy has changed. You have always met these changes. (Governor P).
>
> When everything is said and done, you have made a difference and you will continue to make a difference. (Assistant Secretary of the Navy).
>
> It is the men and women here today whose excellence, service, commitment, and skills made the difference in keeping this facility open. The bottom line is that history doesn't stop. This isn't the end of history. We are now turning the page and starting a new chapter in the history of this facility. (South City Mayor).
>
> You should feel good about how far you've come, and your future is even brighter. Today is a new beginning for the gunsmith of the Navy. As you move to become the Gun Center of Excellence with your partners in industry, you should stand tall and proud. (Vice admiral and commander, Naval Sea Systems Command).

ACME North management and engineering staff were very aware of this political influence; however, this influence empowered the ACME South engineers to be less responsive to the needs of management located at ACME North. Barry O and David L, the present managers of some ACME South engineers, had this to say:

> We have very good political support down there [at ACME South]. We keep them because they provide a lot of political support in Washington. Their long history tells us that they are untouchable. (Barry O. Personal Interview, 2011).

> ACME South has capable engineers, mainly local people and a few that have transferred from ACME North. In the past, the work we sent to ACME South resulted in low-quality output. As a group, the ACME South engineers have developed a sense of entitlement since they know the political situation keep them in their jobs regardless of their effort and quality of their output. (David L, Personal Interview, 2010).

I provide recent history of the relationship and more details on the two projects in Chapter 5. I will describe ACME corporate *habitus* and power structure in the next section.

ACME Corporate *Habitus* and Corporate Power

Corporate *habitus*, or the application of class *habitus* to ACME North and ACME South, provides a good means to compare and contrast the two business units. ACME North corporate *habitus* is directly related to the new products development and the cult of personalities that are selected to lead the business unit. ACME North attempts to not only please the customer but to "wow" them. The ACME North work is high-paced, more quality-focused, and requires high-tech competency. Design change and injection of emerging technologies are a constant. Maverick behavior that supports product development is valued and rewarded.

At ACME South, the corporate *habitus* is related to the maintenance and the steady-as-it-goes leadership provided by the Navy. Product maintenance offers a fairly repetitive work. Though technical, it is considered more a trade rather than a profession. Individualist behavior is tolerated at lower levels. But in most cases, such maverick behavior could negatively impact the maintenance of the product, and may also cause safety and product performance concerns.

ACME South's corporate *habitus* is more influenced not by the individual leaders, but the work that supports the daily responsibilities of the U.S. Navy. It was this "working hand-in-hand

with the Navy" that determined the corporate *habitus* of ACME South. Additionally, ACME South was remade by adding new work and moving in work from other ACME business units. Over time, ACME South adjusted its corporate and individual *habitus* to accommodate the work.

Both ACME South and ACME North seem fairly well balanced with exceptional economic, cultural, social, and symbolic capital, though for different reasons. Their longevity and struggles to survive shows exceptional strength, fortitude, and ability to re-invent themselves. Table 5 (see Table 5) provides a summary of the various powers as associated with each location.

Table 5. Compare and contrast various capital for ACME South and ACME North

Types of Capital	**ACME South**	**ACME North**
Economic	Rich – Viable through the years and provides a required service to the U.S. Navy.	Rich – The go-to place for Navy weapons delivery systems.
Cultural (legitimate knowledge)	Rich - Only business with expertise and tools to repair aging but important systems. Added production capabilities.	Rich - Expertise in new weapons delivery systems design and development. Only business with specific specialty engineering skills.
Social (valued social relationships)	Rich - Strong local government and state government support. Strong congressional support under opportunity and wealth distribution agenda. Cost savings and ability to take on additional production work is attracting more attention from ACME leadership.	Middle – Good relationship with the U.S. Navy. Cost of business is high; ACME management always looking for ways cut costs. Has limited local, state, and congressional support.
Symbolic (honor and prestige)	Rich - Directly contributes to Navy and weapons systems readiness.	Rich – Six excellence awards but this was over 70 years ago.

Both business units also had sound social capital (valued social relationships), within each business unit and with the U.S. Navy as demonstrated by their ability to take-on and complete work and their successes as businesses. The same goes for symbolic power (i.e., honor and prestige) where both had high levels of honor in order to survive the defense environment of cost cutting and closures. Buildings and landmarks are also symbolic capital (Bourdieu, 1977). They become landmarks because they have symbolic value. This provides cultural meaning and environment as sense of prestige; this prestige is then converted [or added] to symbolic power of the individuals in the environment. Considering that buildings have symbolic capital, it is no wonder that ACME North is held in such high regards due to the highest number of excellence awards receive by one of eight such factories in our country.

Considering symbolic capital at the individual level, a defense engineer's training, experience, personality, and know-how can all be considered part of one's symbolic capital that can be packaged to achieve their technical goals. Also as an engineer moves from one project to another, accumulated symbolic capital can be leveraged for prestige and honor. However, one can just as easily lose symbolic capital if they do not deliver.

CHAPTER 4: MY EXPERIENCE AS A DEFENSE ENGINEER

In this chapter I will provide my personal background, how I got into engineering, my experiences at ACME, and expand on the meaning of a professional reputation of a defense engineer.

Personal Background

I have an inquisitive nature and am constantly investigating how things work. I also enjoy discovering things. As a child, I often took apart my dad's old radios and other equipment to learn about them and attempt to repair or make them better. More often than not, I made things worse but enjoyed the occasional or off-chance success, and learned how to handle electricity and standard electrical components. I enjoyed all the natural science-based classes in school, and mathematics was my favorite subject. In third grade, I suspected that there was a relationship between the angles and the length of the sides of a right triangle and tried very hard to "discover" the equation on my own; only to learn about the 2,500 year-old Pythagorean Theorem a few months later- what an "ah-a!" moment.

As a sophomore in high school, I was selected to join a small group to learn calculus. The class was taught by a charismatic Mr. Shah. He was well spoken and very enthusiastic about mathematics and teaching. At the end of every class, he would reserve 10 minutes for students to ask him difficult and challenging questions. He would always start his answers by saying, "That is so easy!" and then walking us through the answer process. Years later, whenever I took a mathematics or engineering exam, I would find myself muttering the same words as I delved into the answers. The challenging nature of mathematics, my overall enjoyment of the subject, and the positive influence of Mr. Shah, pointed me towards a career in theoretical mathematics.

After high school, I continued towards this goal; however, there were not many opportunities for research in theoretical mathematics (besides teaching, which did not then interest me). These opportunities also required post graduate education that I had no means to achieve. So I looked for a career that was mathematics oriented, personally and technically challenging, and fun (or at least my idea of fun). Engineering was the perfect fit. I could leverage my mathematic skills, the work would be technically challenging, and it was a professional, well-paid, career. As it is, engineering is considered "applied mathematics." The big question was, "What type of engineering and what specialty?"

I talked to working engineers to get an idea of the kinds of things they did and what they enjoyed most. They all gave me positive personal narratives and details about various types of engineers. After much consideration and mulling over the pros and cons, I decided that I would pursue a degree in electrical engineering with a focus on analog electronic circuits. The analog circuits would give me the technical and "mathematic-related" challenge that would satisfy my original intent.

I studied electrical engineering at Michigan Technological University and graduated with a bachelor's degree. A few weeks after graduating, I moved to Arizona and started working at a small design engineering company as a junior engineer working on designing Larger Scale Integrated Circuits (LSIC) and Very Larger Scale Integrated Circuits (VLSIC); these are commonly known as circuit chips (a good example is a microprocessor chip). After a few years, I moved on to designing and testing hybrid circuits. Hybrid circuit chips are packaged like circuit chips but also have additional other electronic components in a single miniature package (for example, a hybrid circuit specialized in detecting weather conditions would have a

microprocessor chip, some sensors, and some data storage components). Hybrid chips are typically used on products that require miniaturization and high reliability.

I then joined a defense company as a design engineer to develop military and civilian aircraft electronic controllers. This is where I learned more about being an effective defense engineer. About 22 years ago I moved to North State and joined up with CMC, the predecessor to ACME. I started as a test engineer and progressed to Sr. Staff Systems Engineer. My experience also allowed me to take on some mechanical engineering and software engineering tasks. About 10 years ago, I changed over to systems engineering. Systems engineering is the interdisciplinary and over-arching activity that manages all the systems and subsystem engineering of the complete systems over its life-cycle. I am presently the Integrated Product Team (IPT) Systems Lead for a major product line for ACME North. I love my job especially the opportunity to solve problems and the chance to collaborate with others.

Before taking on the role of systems engineer, I worked on the management side of the business as the Electrical Engineering Functional Manager. I moved back to the engineering side to be closer to product design and development. There is anecdotal evidence that in the defense business one has the chance to experience no more than two major projects that have the perfect mix of personnel, talent, experience, and management to bring to successful conclusion. So far, I have experienced five such major projects, a point of gratitude and pride for me. All these projects have led to follow-on production and continued work for our business. As my career has progressed, I find myself spending less and less time with mathematics and technical analysis, which is usually left to junior engineers or specialists. However, the desired challenges of theoretical mathematics are now replaced with the challenges of managing the whole system, mentoring others, and developing creative technical and managerial solutions.

While working in Arizona, I earned my Masters in Business Administration. After joining ACME North, I completed my Master's Degree in Software Systems. In my overall career as an engineer, I have experienced eight major layoffs, or Reduction in Force (RIF) as commonly called in the industry. Of these eight, I was personally terminated in two of these RIFs and had to move on to other companies. It was a more stressful experience to witness my friends and co-workers being shown the door than personally experiencing the layoffs. I also learned that one can be terminated despite a stellar professional reputation. Despite this periodic chaos in the business, I have enjoyed my career very much and am proud to be a defense engineer. I consider myself a typical engineer.

My Experience at ACME North

When I joined ACME North in January 1992, there were about two thousand employees at this location. Prior to my joining, and due to typical industry churning, the business unit had gone through significant reductions in the late 1980s, and I was one of few that were hired into the company in the early 1990s. From 1992 to 2000, the number of employees increased to 2,500.

I started at ACME North as a test engineer for the development of automated test equipment. My Arizona work experience allowed me to immediately provide state-of-the-art solutions. Over time, this effort led to more test equipment requests from the U.S. Navy customer and a new product line for the company. I was then promoted to manage a small group of electrical engineers assigned to a product line. I enjoyed the management challenges but missed the details of the design and development. After a few years, I took the opportunity to join a new development project as the project's lead electrical engineer. A few years after that, I was approached by the director of engineering to become the electrical engineering department

manager of ACME North. In this position, I was responsible for providing personnel, processes, tools, and expertise to all the projects at ACME North. At one time, I was responsible for over 130 electrical engineers. Of these, six of my reports were at ACME South.

As the electrical engineering manager, I held monthly telecom meetings with the ACME South engineers and travelled to visit with them about twice a year. The mismatch in needs and their limited skills took significant effort to manage. Though it was the responsibility of projects to send the work to ACME South, I did all I could to encourage project leaders to send their work. We had a senior manager, Dave H assigned to finding work for these engineers. Dave H and I would have weekly meetings to discuss and find work that could be successfully completed by these new engineers.

I sent some department work, but they did not have the skills or the experience to write processes and procedures. Upper management provided these ACME South engineers with a special charge number to use in case of lack of work. Over time, I noticed most of the engineers were charging full-time to this special number, simply, they were doing nothing.

As mentioned before, I encouraged project managers to send their work to ACME South but in most cases I was told there was no work to send. Since the engineers already had the special charge number and work was not necessary. Everyone knew that this was an ‘overhead” number and that meant the charges could not be passed on to any of our customers and was negatively impacting profit. Most project leaders saw this as cost of keeping competition out of our gun business. I got to know Mark M. when I worked with him to send some electrical engineering gun work design to ACME south. He was one of few project managers who were willing to send work to ACME South. I also noticed high absenteeism, increase in sick leave, detachment from meetings and work, and reduced quality of work from ACME South engineers.

This was a sharp contrast to the engineers at ACME North who were vibrant, engaged, and driven. How could one company have such disparities?

After four years as department manager, I switched back to the design and development side. Since I had project and funding responsibilities, I would carve out work for the ACME South engineers on my projects, and I was very satisfied with their work; however, due to limited scope and funds, this effort was for a few of these engineers and not the remainder of the ACME South engineers. The ACME South engineers I worked with were competent, capable, driven, and they delivered quality, on-time work. In some cases, these engineers travelled to ACME North to closely work with their counterparts. Some even spent many weeks with us at ACME North to complete their work.

Through these years I had continued to develop my systems engineering skills, and in 2010 I was promoted to lead systems engineer for a large product line. In this position, I get the right combination of management, systems engineering, and design and development experience.

My Experiences During the Various Eras at ACME North

CMC Era. ACME North has undergone significant changes during my 22-year career at the business unit. The location has gone through four different owners: CMC, United Industries, Venture Investment (a pseudonym), and ACME. I joined the company during its "renaissance" days when it was run by CMC. In the early 1990s, the business was just coming out of the major cost reduction of the Reagan buildup. CMC, a major industrial chemicals provider, had a very hands-off corporation that provided component leadership mainly because defense was not a core part of its corporate charter. Each business unit was a profit centers; therefore, CMC was hands-off and rewarding if you met or exceeded your mark. CMC added to the Midwest Pump's "Lone Wolf" culture and successfully combined it with competent, post- Blackstock leadership.

The management structure was a combination of promotions from within and new talent added into the mix. This leadership increased production, added more engineering, and bid for more work than previous administration. Employee education and well-being was encouraged. Friday dress code was flexed to allow jeans. Engineering initiatives, adventurism (or risk taking), and efficiency was highly encouraged and rewarded. The business was also successfully transitioned from mainly a production factory to a mainly engineering company (with limited manufacturing).

In 1992, the whole plant was jam-packed with manufacturing equipment and had two production shifts. By 1995, the production lines were down to one shift and one-tenth of the previous capacity. However, engineering was on the rise. I was one of the first in the plant to get a personal computer since I was involved in software design for my test equipment project. There were computers in the plant but they were mainly for shared purposes in allocated computer rooms. Due to the success of my test equipment project, I was recognized at various meetings as well as awarded recognition for outstanding work. I travelled to various customer sites and navy locations to attend design meetings, product tests, and technical investigations. I was given all the tools I requested. We had social gatherings, prizes, parties, and celebrations to develop a strong group identity. Each business unit managed their own HR, Program Management, Engineering Management, Production, factory management, IT, Security, finance, and engineering support.

I enjoyed the CMC days as a vey care-free time full of adventures, hard work, learning the business, and personal and group rewards. As a junior engineer and a young manager, I had more freedoms to accomplish my tasks and had others to help me remove any barriers in my way of completing my tasks. I also was given everything I requested to improve my products,

increase my efficiency, and experiment with new tools and equipment. I was also surrounded by many competent and capable workers that have remained my friends to this day

United Industries Era. When CMC combined its defense holding with Barsco to form United Industries, the leadership for the newly formed group was established in Washington D.C. and many of the leaders were selected from ACME North. This helped established ACME North as the place to mine for future leadership. With United Industries came a big focus on winning proposals and increasing productivity. This led to a reorganization from a mainly matrix focused organization to a program centric structure. Each business unit was again considered to be a profit center and allowed to manage all aspects of their own business. This method allowed for various businesses to be sold, exchanged, shuttered, and added into the company without too much disruption. The downside was the extra cost of supporting all aspects of the business at each of the locations. Top management was mainly from promotions within.

During this era, ACME North established itself as the location for engineering excellence and many programs were successfully completed. However, as the electrical engineering department head, I faced many challenges including reduced funding for training, corporate level restrictions on hiring when we were faced with engineering backlog, and the daily grind of dealing with employee and management issues. Though this was more related to my job and not the overall United Industries' way of business, my overall sentiment is one of significant personal growth, insufficient time to do all that I wanted, and many unsatisfying times. There were also some good experiences especially doubling the size of the electrical engineering group. It was during this era that ACME South joined into the ACME North business group.

Venture Investments Era. Venture Investment bought out all of United Industries and pumped money into improved infrastructure, new tools for management and technology, and processes

for efficiency. Venture Investment was a hedge fund run by various government and high-tech leaders that had significant knowledge of the defense business. The plan was to get high returns by streamlining, removing redundancies, increasing intra-company sharing of resources such as production. The culture remained the same as United Industries and leadership was mainly from inside growth. There was continued effort to reduce bureaucracy. This era was one of continued accomplishments for me. I had adequate management experience and had good knowledge of the business. I continued to be recognized as a problem solver and capable of completing my assignments. Further consolidation moved Finance and IT to shared functions across the various businesses. From initial purchase to sale, there was a four-fold increase in value of United Industries under Venture Investment.

The implementation of project Catapult was during this era and my personal sentiments regarding ACME South were less than favorable. I had bought into the culture clash and was very opposed to sending significant work from the North to South. This was a common sentiment at ACME North, and I was unduly influenced by the grinding competition that had previously existed between the two. Like many others around me, I was unable to grasp the new situation, or that these types of changes were typical to the industry. I also considered the move as a sacrifice of jobs at ACME North.

The initial problems and issues faced by project Catapult validate my opinion that the move was a disaster. However, I was wrong in the long term. The move allowed for ACME South to reinforce and legitimize its importance to the overall well-being of the product line. The lower cost also allowed for more products to be purchased by our customer and resulted in even more work for ACME South. Once the system was fully established in the U.S. Navy, foreign Navy customers also purchased the system adding new workload and additional cost-

savings. I consider my initial opinion on this as an emotional response. I missed the leadership moment.

ACME Era. ACME purchase did not bring any changes right away. However, the company leadership in Washington D.C. was completely gutted and new top management brought in from outside the business and overseas. ACME purchased the business at the height of the defense market. Reorganization in 2009 completely changed the structure from program-centric to a remote-management organization. Since ACME was a foreign owned company, it reminded me of how colonies were ruled through remote bureaucracy, top down decision making, and outsiders making decisions without getting to first know our business and culture. This restructure led to the rise of the "bourgeoisie" not only at the head office in Washington D.C. but also at ACME North. Part of the distributed management structure was to assign enough middle managers in the various locations to support the management structure. This was done in a way that did not recognize the most competent managers.

The ACME era further removed any capabilities for the businesses to stand on their own. HR, engineering management, program management, safety, security, and support systems were all combined across the ACME enterprise and redistributed throughout the U.S. This means that each of the businesses do not have the capability to stand on their own and have to rely on remote locations to provide that support. This would also mean that each of the ACME businesses is no longer attractive to other defense companies and venture capital since they would have to set up full services prior to purchase. This leads to two options for ACME if the business fails – send more work to it from other locations (reminiscent of North-South relationship) or shut-down the place. To date, ACME has had to shutter six locations in the last

few years. Partly due to the organization setup of interdependence, they are unable to splinter off and sell these individual businesses to other defense contractors.

The new organization also led to a significant rise in overhead costs, and therefore a reduction in profit. The vice president in charge of the restructure was summarily moved to the corner office and many working jobs were cut in order to accommodate the demotions of some middle managers. The restructure continues to haunt all aspects of the business. One example is the remote focus on efficiency reduced any capability to take on additional work. We just don't have any spare engineers available to take on any new work. It now takes more effort and up to four months to bring in a new engineer. Having experienced continued change in the industry, I take this as just another adjustment and take the time to reflect on the good outcomes and the follies of management. Other cost-cutting and profit-increasing measures have included reduced pay increases, demotions in rank (and therefore pay), and restricted training.

One unintended result of all this internal churning is that the present makeup of the engineering group at ACME North is exceptional since only the resilient have remained. With continued layoffs and heavy focus on productivity, the folks remaining in the system are highly capable and some of the best I have worked with. It has also meant with lack in direct or close management, most of us have developed a more independent way of accomplishing our work without involving managers. This has led to less dependence on the bureaucracy and more on informal groups and personal contacts. Despite lack in leadership, the work still gets completed due to self-directed workers.

The Engineering and Management Experiences of Hero Engineers

Both our subject engineers have significant engineering and career experiences. It was very difficult to have them talk about themselves. Here Mel G describes his round-about way of ending up at ACME South. Notice his serious undertaking of the commitments we had made as part of the purchasing agreement:

> I am a senior project engineer. Graduated from U of Illinois and worked for CMC in Iowa City, Iowa. I moved to [North City] in 1982 to join up with this division; was about 20 years old and worked missile launchers and gun systems.
>
> In 1996 timeframe when we privatized ACME South, I moved to ACME South in order to satisfy the commitment to start an engineering department there. At that time the project I was on an Army project and the project consented to move [a small project] to ACME South. One of their conditions was to have someone from ACME North go to ACME South to help transition and help work at project. My name came up to do that and I was happy since to do that. I don't have that many ties here in this area and having come up here from Illinois, ACME South was closer to that.
>
> I went to ACME South to work the [Army] project. Was there for a year and a half for that task and when the time came for me to come back, I was approached by Mark M, program engineering manager for Catapult to take a job with him and remain at ACME South. So I have been there ever since. Though some organization changes at ACME South and when one of the managers was let go, the overall management setup was split up into two positions and me and Tom B. When Tom retired, I took up the whole responsibility and now I am the engineering manager of ACME South. (Mel G, Personal Interview, 2011).

Mel G describes his amorphous role and himself but refusing to recognize his leadership:

> It is kind of confusing situation. Technically all of the ACME South engineers do not work for me. With the distributed management system [i.e. the Cheese Wheel structure], they all report to other functional managers that are not at ACME South but all over the place including ACME North, Michigan, California, and Pennsylvania.
>
> They don't even report to me on the technical side since they have their project leads typically at ACME North. I still am somewhat responsible to making sure they are busy, that everyone is getting attention. Not to get

> deeply involved with their detailed work but give them guidance and direction. Help coordinate with ACME North personnel.
>
> I am a very reluctant leader. I enjoy the work but I do not like to performance appraisal and all the bureaucratic work but I like teaching and helping the younger folks. The leadership thing is something that I have not sought out. (Mel G, Personal Interview, 2011).

I will describe the cheese wheel structure before I get back to Mel G. The 2009 reorganization was called the "cheese wheel organization structure" by the ACME North engineers. The organization diagrams made no logical sense. In a way, it was taking the remote management setup between ACME North and ACME South and applying that to the whole ACME corporation. The issues between ACME North and ACME South were now being amplified across the whole ACME corporation.

Though it is against his nature to be social, Mel G demonstrates his willing to be flexible when it comes to being available, helping junior engineers, mentoring the kids in First Robotics:

> Most people consider me not a very social person and I will admit that. I don't like large groups of people. I play golf. My family has a hard time sometime even getting me to talk to them. So helping younger folks is something that I like. I do the First Robotics things with kids. I am not very social but am flexible when I need to be especially when sharing and teaching.
>
> But I make myself available to everyone. My door is always open. I put everything aside to take care of them and talk through things. (Mel G, Personal Interview, 2011).

Here he recognizes the need for experience rather than titles when he talks about what he sees around him. He understands that it takes time and experience to build wisdom:

> A lot of engineers are more people oriented and they may be more looking for the next opportunity. In my case the opportunities found me though my hard work; I do not go searching for the next big thing. That is one the main struggles for me are the people who are looking to fill the next position rather than just do their job right. I think if you did your job right, the opportunities will come. Rise to the top by doing your very best not just shuttling around

> form one job to the other for advancement reasons. (Mel G, Personal Interview, 2011).

A Defense Engineer's Professional Reputation

A defense engineer, like all other workers, has to navigate through many personal challenges and pitfalls. As one navigates through these challenges and continues to gather the experiences, defense engineering becomes an integral part of one's being. In this section, I describe my own history and experience as a defense engineer. I then describe what it takes to develop a defense engineer's reputation. According to Goffman (1961) each professional reputation, and behind this, each self, occurs within the confines of an institutional system. The professional reputation in this sense is not a property of the person to whom it is attributed, but dwells rather in the pattern of social control that is exerted in connection with the person by himself and those around him. Recalling Goffman's (1961) professional reputation from Chapter 1 and the experiences one encounters in its development, I believe all the experiences outlined in figure 4 (see figure 4) also apply to the development of a professional reputation in defense engineering.

At ACME North, I can best describe the growth of an engineer as the accumulation of professional reputation chits or the collection of good engineering deeds that lead to a more liaise faire environment for accomplishing your assigned work. This is the building up of independence by earning the confidence of management so that one can choose how to accomplish one's goals without oversight or criticism from others.

A Defense Engineer's Typical *Habitus*

Bourdieu (1997) describes *habitus* as the mental and cognitive structures used to deal with the world, internalized methods, and internalized structures. Levering this, Nguyen (1998) general

description of an engineer and my personal experience, I developed the following description of a typical defense engineer and a defense engineer's typical class *habitus*:

- Is a problem solver with the desire to bring concepts to fruition.
- Has a highly developed mental equity in area of specialty, science and general engineering.
- Has a linear, structured, and reasoned thinking to define, interpret, evaluate, and judge.
- Is detail-oriented and a team player.
- Is highly inquisitive about science and technology.
- Is future-oriented with positive outlook.
- Has low impulse-reaction; ability to work on projects for long periods of duration and propensity to think things through before taking action.
- Could have difficulties communicating with non-technical, emotive, or non-linear thinking other.

A Defense Engineer's Typical Class *Habitus*

Class *habitus* for a typical defense engineer is:

- Middle class upbringing, male, highly educated, conscientious, and continued learner through personal and technical challenges.
- Be at ease in navigating the engineering world but may have a sense of awkwardness in other social fields.
- Thinking everything can be explained scientifically and that mathematical models can be developed to closely simulate the real world.
- Thinking they are engineering for a better world.

A defense Engineer's Capital

A defense engineer's capital is accumulated through various means. Type of capital and the means to achieving are provided in Table 6 (see Table 6).

Table 6. Types of Engineering Capital

Types of Capital	Means
Economic	- Progressing through the ranks to higher titles with more responsibilities
- Cultural - (legitimate knowledge)	- Engineering degree(s) - Defense Engineering experience - Past successes
- Social - (valued social relationships)	- Association with respected mentors, managers, and other engineers - Ability contribute to the progress and well-being of one's team - Ability to help others when called upon
Symbolic (honor and prestige)	- Recognition awards at team, business unit, and corporate levels - Promotions - Honorable mention in company literature - Number of years at one place of work - Monetary awards

Engineering and the Perfect Project

The desire of defense engineers is to participate in the perfect project. This perfect project is the combination of honest (Goffman, 1959) and hard work, right collection of supportive and contributing team members, supportive management with balanced cost, schedule, and quality focus. Concluding with a successful product is one that not only meets but exceeds expectations. A perfect project is and emotionally charged environment, with heightened awareness, and moments like Durkheimian high social events. This is "the great chase" most of us want but

rarely experience. I believe that most defense engineers experience this one or twice in their careers out of the ten major projects that they will have worked on.

CHAPTER 5: CONDITIONS FOR THE RISE OF *PHRONESIS*

In this section I will continue with recent history and document the environment that precipitated heroic action and *phronesis*. Remembering that ACME North and ACME South have a "poor cousin" relationship, I will use that and the transition of the two projects to ACME South as a background to demonstrate that the two hero engineers applied *phronesis*. As mentioned in Chapter 2, Mark M is the Program Manager of the Catapult project and Mel G is a senior level engineer, formerly from ACME North and now working at ACME South. To recall from Chapter 1 and Chapter 4, *phronesis* is translated as prudence, moral intuition and practical wisdom. Flyvbjerg (2008) adds that an expert is one who operates with *phronesis*.

> An expert … operates from tacit skills which are skills that are characterized by the highest level of the learning process. …..and commonly called practical consciousness. (Flyvbjerg, 2008, p. 35).

> In Aristotle's words, *phronesis* is a "true state, reasoned, and capable of action with regard to things that are good or bad for man." (Flyvbjerg, 2008, p. 2).

> …*phronesis* emphasizes practical knowledge and practical ethics. *Phronesis* is often translated as "prudence or practical common sense." (Flyvbjerg, 2008, p. 56).

> Intuition is the ability to draw directly on one's own experience – bodily, emotional, intellectual –and to recognize similarities between these experiences and new situations. Intuition is internalized; it is part of the individual. (Flyvbjerg, 2008, p.21).

Both hero engineers, Mark M and Mel G, demonstrated their ability beyond just scientific and technical thinking. They seem to understand that this was a social and moral issue that required a non-scientific approach. This is the central theme of *phronesis* in that social subjects are best solved by the public deliberation and not by science (Flyvbjerg, 2008). Since engineering is about applying mathematical and scientific rules, many in the field become jaundiced into thinking science can solve everything, including social and management issues.

A good example of a non-*phronesis* act is the hiring of large numbers of personnel before award of contract. This was neither a scientific nor *phronetic* decision.

> We had a catch-22; we had to hire the people so we would be ready when the projects came along. At the same time you hire people you do not have work for. There was a long time when bad habits were set. They did not have a lot of work to do; they were not used to doing a lot. They surfed the web all day long; spend a lot of time on the phone. When I first got here, there was no one who put in a full day's worth of work. (Mel G, Personal Interview, 2011).

Another example of non- *phronesis* is ACME North firing their engineers to force managers to send work to ACME South despite more than adequate work for both business units. However, after the layoff, the work still did not move to ACME South.

> We were anticipating the Future Gun (a pseudonym) program to be awarded to us, so we hired all the ACME South engineers. However, the program was awarded to [our competitor] and we now had additional engineers we did not know what to do with.
>
> More than 50% of the ACME South engineers do not have any work [as of 2010]. We had to reduce [or lay off] ACME North personnel to see if we could send that [surplus] work to ACME South but even then we did not fully utilize ACME South [engineering]. (David L, Personal Interview, 2010).

As mentioned in Chapter 3, the dismal condition of the relationship between ACME North and ACME South was the result of years of contentious relationships between the two business units that magnified after their uniting. The purchase deal also added pressure on ACME North to demonstrate good faith but the actions were ill-thought and premature (Render, 1997).

The Challenges and Upturn of ACME South

With the privatization of ACME South, also came various commitments that initially seemed minor but came to dominate the relationship between the two business units. These

commitments were stipulated in the privatization contract and constantly monitored by South City and the state's congressional senator. One such commitment was to provide more engineering and production work at ACME South to keep the business viable. In 1998, Mark M volunteered to transition his Catapult production from ACME North to ACME South. He saw this as a logical choice since ACME South already had significant equipment and tooling capability that came with privatization, and ACME South personnel were already familiar with repair and refurbishing of the Catapult equipment. This would also take up some unused production capacity at ACME South.

Another advantage was the cost saving from the reduction in high-paid union workers at ACME North. This was the opportunity to break the production workers' union stronghold at ACME North. Due to high wages and union concessions, ACME North was one of the more expensive locations for production. This move would decimate the ranks of union production workers and eliminate the Auto Workers Union, a partner for over 60 years, at ACME North.

> The big change was that we moved the production line to ACME South. Within the first few years we moved all assembly and test functions to ACME South. A lot of the parts fabrication was still at ACME North but over time, all of that either contracted out or brought to ACME South.
>
> When we went into the second generation Catapult production, we started up at ACME South. Since that was very successful, we did the same for third-generation Catapult. After that, all new production will now be at ACME South. (Mel G, Personal Interview, 2011).

In the long run, ACME North became the design and development center of excellence and ACME South became the production center of excellence. In the next few subsections, I will describe some missed leadership opportunities.

More engineers than needed. As part of the privatization agreement, ACME North management was asked to determine the future number of engineers at ACME South. They

would then have to hire and retain these new engineers. It was decided that there should be 50 engineers at ACME South.

> My understanding of this is that there were about 100 people working Catapult [at ACME North]. My boss, the director of Navy Programs said we should put half that [number] in ACME South. (Mark M, Catapult Program Manager. Personal Interview, 2011).

Though there was a graduated timeline for hiring these engineers, many were hired immediately upon completion of the agreement to demonstrate CMC management's commitment to the deal. However, there was no work available for these new engineers and finding appropriate work turned out to be a challenge for mid-level managers at ACME North. This also demonstrated the conditions and the dilemmas of the whole industry.

> We had a catch-22; we had to hire the people so we would be ready when the projects came along. At the same time you don't want hire if you do not have work. (Mel G, Personal Interview, 2011).

When Mark M was asked on attempts to put these engineers to work:

> [It did] not [work out] very well (laughs). Dave H, a manager reporting to the Director of Navy Programs was assigned to take care of transitioning the work to ACME South. He had the responsibility but no authority to go back to the individual program managers [like me] to say this, this, and this jobs are now moving to ACME South. Most program managers like me were not willing to move parts of our programs to ACME South. So Dave H was not able to get to those numbers. No one said to us program managers "You shall do this! We are moving work to ACME South and make it happen!" (Mark M, Personal Interview, 2011).

I remember this time since I was the functional Electrical Engineering Manager, and the electrical engineers hired at ACME South were always in need of work. Dave H and I would have weekly meetings to find the right type of work for these engineers. The ACME South engineers did some work for me in the early years, and I was very satisfied with their work; however, this effort was a small effort of limited duration. The engineers I worked with were

competent, capable, driven, and they delivered quality, on-time work. In some cases, these engineers travelled to ACME North to closely work with their counterparts. In a few cases, these engineers spent many weeks with us at ACME North to complete their work. Positive experiences with ACME South engineers seem to have gotten lost in the focused attention on a few failures. These failures were then translated to the whole ACME South organization as unworthy.

The move of the Catapult production line to ACME South provided work for 12 of these loss-leader engineers with production support work. However, more than half the group was still significantly under-utilized.

> So we were always trying to nibble away at the work at ACME North [and send it south] to better engage the ACME South engineers. I was concerned that since the Catapult program was used to determine the number, I was going to have to do the most transferring of work. This meant loosing ACME North people that were doing very good work for me. So we tried to nibble away at it but were never very successful at that. (Mark M, Personal Interview, 2011).

> The real challenge was to give them direct-charge work (see section 3) [so that they would not impact profits]. This has been the challenge ever since the organization existed down there. The utilization was about 80% when I took over then it dipped into the low 70s and then we brought it back up to upper 80s and lower 90s. It is one of those things that require constant pushing and managing because by default people do not send work to ACME South. (Barry O, Personal Interview, 2011).

> ACME South has lost four engineers in the last RIF. This is the first time that we laid off people there. We were 32 down these and now down to 28. At ACME North we would RIF poor performers and keep nothing but the best. Unfortunately, that is not what we have done at ACME South where we saw even worst performance. Only recently did we start laying off poor performers at ACME south –even then, it is a very rare case. (Barry O, Personal Interview, 2011).

> We never got to the point of 50 engineers at ACME South. The original commitment was 50. Over the years, people have played that number differently because we eventually reach the point that if we combine logistics

> engineering with ACME South engineering, it would be greater than 50. (Mel G, Personal Interview, 2011).

Wrong engineering skills. Top management had also hired engineers without involving any of the functional or project managers to find out what skills were needed for ACME South. Therefore, they hired inexperienced, production support, and generalist engineers when the business needs were for experienced, design and development specialists in defense hardware and technologies.

> … most of the folks here do not believe ACME South has the same quality engineering as we do at ACME North. I think we have to be very selective about the work we move down there.
>
> Since we did not send enough people from North to South, [there] is limited mentoring of these engineers. They don't seem to know what it takes to do good engineering.
>
> …. There are two different levels of people at ACME South. The few people that were engaged were delivering but the majority looked at managers to do everything for them and put the work in their hands for them to do the work. Even then, they wanted managers to make every decision and had no skin in the game.
>
> I had to tell many of them that they were part of the solution and to quit talking about us manager as unable to work it out and how stupid we are. ….always complaining that they did not get enough support from management. (Mark M, Personal Interview, 2011).

Us and them. Since ACME North had an engineering group made up of more than 350 engineers of various disciplines, it did not need too many outsiders to help with design and development. Any communication, under this circumstance, was as simple as walking over to the desk of another engineer and getting the help needed. They also had easy access to management. As a result, most did not develop the skills to work outside their "four walls." With the new relationship, these engineers were now asked to work with "outsiders," and many simply did not know how to do this. Additionally, previous effort by top management to

vilifying ACME South was still lingering in the system and many ACME North employees, including middle management, still believed in the outdated negative rhetoric. This further decayed the relationship between the two business units and developed an "us and them" culture on both sides.

> We forget that the ACME North engineers are easy to organize because most have been around for a long time and know what needs to be done. Management is also available and within reach. At ACME South, we have always had to feed them work and it makes for a very time-consuming management activity that we are not used to doing.
>
> For the longest time, there are three of four of us here who struggle daily to find work for the ACME South folks. We treated them more like a contract engineering house; more like an extension of ourselves [but not part of us].
>
> I did not see the drive in ACME South people to get things done. When I was responsible for them, I used to go down there and kick some butt to keep things moving. I'm not sure enough of that is happening any more.
>
> They just don't seem to have the motivation and so people here [at ACME North] were reluctant to engage or deal with them. If you went to a contract house to get your work done, you make a deal and they deliver or don't get paid. This is not the same at ACME South.
>
> Even today, there is still the same mix of good and bad engineers [at ACME South]. There are a few that we can easily work with but the others have an us-and-them mentality. These ACME South engineers never got along with ACME North management; they blame everything on us. Maybe looking back we should have done a better job of uniting the two locations. (Mark M, Personal Interview, 2011).

This meant that all the good engineering work remained at ACME North and the leftovers – the ones emphasizing drudgery and boring work - went to ACME South. Mark M uses "selective" as a euphemism for the simple, uninteresting and unexciting work. This showed the hierarchy established by ACME North.

> If you are selective about what you put down there, it works. They are good on the mechanical, OK on the cabling stuff. If you need any software or electrical circuit board design it does not work. (Mark M, Personal Interview, 2011).

Surprisingly, unrelated subjects such as the salaries paid to the ACME South engineers also caused animosity between the workers of the two business units. AMCE North engineers were irate because ACME South engineers were getting the same wages. This was petty since ACME North wages were not impacted. However, it demonstrated a perceived hierarchy by the ACME North engineers. This also shows frustration on Barry O's part since it is his responsibility to find and channel work to the ACME South engineers.

> We have some very interesting folks down there. They know they cannot be fired due to the privatization agreement and are happy to remain under-utilized. They have one of the best gigs in the entire city. Up until last year, they were paid the same scales as us [ACME North] and we all know that the cost of living in South City in a lot lower than what it is for us [in the north]. (Barry O, Personal Interview, 2011).

As to why these challenges continue to fester,

> Some of it is related to [their] egos – [ACME South engineers think] we know better and no one can teach us any better. [On the ACME North side, it is] ignorance and not knowing what the ACME South engineers are capable of doing. Over time due to the nature of the business, ACME North has gone through many reduction in Force (RIF) and has lost a lot of great engineering capability; this means that the remaining [ACME North] engineers (which is about 40% of where we used to be five years ago) are extremely capable and the very best that we can retain. (Barry O, Personal Interview, 2011).

Both Mark M and Mel G were able to transcend this us-and-them mentality because they took the effort to know the ACME South engineers. To most at ACME North, these engineers were faceless names that could be easily objectified, but not to Mark M and Mel G. Though both were frustrated with ACME South engineers, they did not give up on them and saw a future where the two sides worked together. They saw the system as the problem and not the engineers.

I must admit I was part of the us-and-them crowd and looked upon ACME South as competition. I now recognize that I was mistakenly influenced by the system and did not fully

grasp the nature of the hero engineers and what they were trying to accomplish. I was unaware of the changing environment that the hero engineers were very quick to recognize. If I had the maturity, I would have recognized that the hero engineers were attempting to "elevate all boats."

Fractured management. ACME middle and upper management were also not of a single mind on how to successfully implement an engineering group at ACME South. Mark M dismantled the organization his predecessor had set up.

> It was Dave H for a few years [who managed the ACME South engineers]; then I took over [to make sure there was engineering work at ACME South]. In my opinion, Dave H was trying to recreate ACME North engineering at ACME South. He wanted a whole engineering organization at ACME South like what we have at ACME North. I thought it would not work because it would take about 300 people minimum to have a complete, viable, and self-sustaining engineering organization with its respective departments and managers at ACME South. We could not do that, there just was not that amount of work.
>
> My attitude was that we were here for two reasons. We support production because that is what we do down there and we are here to support the fleet; part of logistics and in-service engineering.
>
> When I took over, I restructured ACME South and focused the engineers towards strictly mechanical and electrical engineering work. I told them to be generalists and not specialists [capable of doing a variety of things and not necessarily relaying upon one specific expertise]. This way they could do many things. (Mark M, Personal Interview, 2011).

Besides direction, there also seems to be a void in communication flow-down from ACME corporate leadership.

> The main problem was communication. It was not flowing from the top down and seems to be an ACME wide problem so looking at the situation between ACME North and ACME South should be looked at as a greater ACME issue rather than just the two business units.
>
> No one at the corporate level is driving this communication and team work – even now. I saw a friend who works for a rival company and he told me that if ACME business units could [work together] ACME would be dangerous

> for the rest of us in the industry. We just don't know how to effectively work together. (Barry O, Personal Interview, 2011).

Only select managers were held responsible for utilizing these ACME South engineers.

> When we changed the organization in 2009, and I no longer had the responsibility, it led to a very strained relationship with ACME South because I lost the visibility on the progress on my project. My project could be jeopardized if ACME South did not deliver.
>
> It was even worse when trying to drum up work [for ACME South] outside of my program. It led to some bitter and strained relationships with my management peers. Some managers just did not want to help out and it caused me a lot of headaches because top management was just not fairly distributing the pain. They should have said this is a huge objective and we need to keep the ACME South folks fully engaged and utilized. That was not getting flowed down [to middle management]. (Mark M, Personal Interview, 2011).

As for why upper management did not get involved, I believe that these ACME South engineers were considered "loss-leaders."

> There was millions of dollars incentive to buy out ACME South. I don't know why top management did not want any involvement to make it work. South never got the attention it needed. I thought it was a big deal to keep ACME South working and utilized but it was not a big deal to top management.
>
> I think top management thinks it is fixed enough with some "Band-Aids." (Mark M, Personal Interview, 2011).

I do not believe that ACME North management intentionally acted contrary to the benefit of the whole system; they simply did not know what to do and were exasperated by the lack of success in implementing scientific and technical solutions to this human integration problem.

ACME North management realized they did not have all the power and they had very little influence and control over the ACME South employees. It also showed the power shift due to the contractual agreements and the involvement of various third parties (U.S. congress, South State, and South City) that had vested interests in the well-being of ACME South employees.

Simply, the power in the relationship was shared with others that may have diminished the legitimacy of the managers at AMCE North.

Applying Bourdieu's (1990b) various types of capital to the situation shows the complex relationships that come about when evaluated through economic, social (relationships), cultural (legitimate knowledge), and symbolic (honor and prestige) capital. The conflict between the two business units came about from management not recognizing and leveraging the social, cultural, and symbolic capital that each business unit brought to the relationship.

Mel G and Mark M rose above despite the chaos in the system. They took the opportunity to leverage their social, cultural, and symbolic power to improve the system (increase engineering utilization) and empower (rather than marginalize) the disenfranchised. The paths taken by Mel G and Mark M were risky since they both went against the norm and in different direction from their peers. In a way, the two heroes navigated through the hardship their peers were unwilling to undertake to implement their ideas and plans for ACME South. Both Mark M and Mel G had significant cultural (legitimate knowledge), social (valued social relationships developed with ACME South engineers), and symbolic (honor and prestige earned through leadership action) capital. However, Mel G, Mark M. and their accumulated capital was unknown or unrecognized by ACME's top management.

Top management's behavior may also provide an opportunity to apply total institution to ACME as presented by Goffman (1961). To recall from Chapter 1 that some total institutions have a significant split between those with highly prized responsibilities and privileges and the various other groups. This could be applied to the conditions at ACME since top management took the liberty to unilaterally reorganize regardless of impact to others. I now see this act as a

desperate attempt to fortify their powers; but it backfired since they did not have background or knowledge of the business they were tasked to lead.

Unstable Organization. During this period, the organization went through significant changes. In 1997, CMC sold its defense holdings to Venture Investment Group, a Washington D.C. based investment bank (see **Error! Reference source not found.**). Venture Investment streamlined and cut costs across the board to increase profitability and in 2001, Venture Investment took the holdings public but retained major share. In 2005, foreign-based but U.S. subsidiary, ACME Systems bought out all interests and merged it with their other U.S. businesses. Each successive ownership change brought about another round of reorganizing and cost-cutting. In 2001, Mark M took over the responsibilities for the ACME South engineers from his predecessor Dave H and moved away from the earlier plans and visions.

> …this was in 2001 reorganization that made our ACME North organization more project-focused and less of a matrix. I moved ACME South away from recreating a full up engineering organization. (Mark M, Personal Interview, 2011).

The New Reality

Inconsistent workload, organization instability, and low engineering utilization continued to be issues for ACME South. To overcome some of this, Mark M moved a very large chunk of work that was being done by his logistics group at ACME North. This workload included the writing and managing of operational, maintenance, and training manuals for the Catapult project. This Reverse Colonize project meant reduction in capability at ACME North but Mark M saw this as a natural fit at ACME South and would better use the available personnel.

> How [Reverse Colonize] came about was that in 2006 when Mark M was in charge of ACME South engineering, he also had the ACME North logistics group and he made it happen. (Mel G, Personal Interview, 2011).

> Most program managers were not willing to [send work to ACME south and] risk the tight budgets and schedules of their projects. So after that, I decided that we should move the Logistics group [to ACME South] to help with the numbers.
>
> The reason for this move was that the Navy's in-service engineering was already down there and they were closely related to the peer side activities. Colonize was low risk, they were already working very closely with ACME South. We felt this was low risk. (Mark M, Personal Interview, 2011).

It was decided that various new positions would be created at ACME South to do this.

> We basically said to ACME South, "You are now the logistics center of ACME". From now on, there will be no more logistics work at ACME North.
>
> Most of my management peers did not agree with me. This did not stop us since this solution would also better streamline the logistics process. We hired 12 logistics specialists and a manager at ACME South and I move all the work that we had from the north. Since then, we have taken on more Reverse Colonize work and it takes up more of our ACME South people. I don't remember the exact number but there is more work than before from the U.S. Navy. (Mark M, Personal Interview, 2011).
>
> This also added to our engineering workload at ACME South since the logistics group needed engineers for tech checks, to provide graphics, and to help them with training sessions. (Mel G, Personal Interview, 2011).

With the transition of Catapult and Reverse Colonize projects completed, fine tuning was still underway but overall heading in the right direction with higher engineering utilization. However, everything went back to chaos in 2009, a very pivotal year for both Mark M and Mel G. Due to a complete, top-down reorganization, Mark M was stripped of his responsibilities for ACME South and reduced to only being the program manager of the Catapult program. Mark M believed that he was heading in the right direction with the ACME South engineers and the reorganization in 2009 seems to have left him a little bitter. He was not allowed to complete his vision. However, his implementation of the reverse Colonize project was a complete success.

> When [ACME came] in 2009, we again reorganized into technology teams [back matrix-heavy organization]. I was no longer responsible for them and went back to just my program manager position. The ACME South logistics employees fell under Readiness and Sustainment side of our overall business and the rest [of ACME South engineering] was fractured and redistributed into other technology teams.
>
> I no longer had the large number of ACME North and ACME South personnel as part of my organization. Now all the workers were split amongst other functional and specialty managers in the cheese wheel (see Chapter 4).
>
> This changed my relationship with the folks at ACME South. Now I don't go down there at all since I am no longer in charge of the people. I don't have to train them, redirect them or anything. Now it is back to the Dave H way where the people who do not have any workload themselves are responsible or making sure the ACME South engineers are gainfully working. We are back to where we were before. If these managers don't have any workload themselves, how can they help ACME South? (Mark M, Personal Interview, 2011).
>
> One other thing is the ACME South engineering issue and how we work between the various facilities. The distributed management aspect is more cumbersome and less effective and does not work. This method did not work between our two business units; ACME took that bad model and applied it to the whole organization. Go figure, they did not look in their own back yard to see if that was a good thing to do. (Mel G, Personal Interview, 2011).

The 2009 reorganization seems to still haunt everyone. The main concept for this new management structure was to reduce overhead costs by creating a super-matrix, borderless structured organization at the highest level and without any product line, function, business unit, or state boundaries. At ACME North, this was commonly referred to as the "Cheese-wheel organization" (see Chapter 4). The fracturing of the organization was not done at individual site level but it took everyone from seven major engineering locations and split them into technology groups. The technology groups were also arbitrary and lacked any intuitive structure. Most of us had never seen such a haphazard organization even in theory. This was stove-piping at

extreme; easy to manage but difficult to get anything done without involving many across various sites.

> The new 2009 ACME organization [further] reduced the relationship between ACME North and ACME South. Now it is managed by distributed team [with management and workers scattered all over the U.S.]. Everyone has a bit of ownership but not the overall [responsibility]. (Jason A, Personal Interview, 2010).

In essence, the way the two business units was previously organized, with ACME South engineers reporting to someone at ACME North, was now the corporate-wide method of managing engineering personnel. This meant that an engineer's immediate manger is most likely located in another ACME business unit. The new organization was to reduce over-head cost (and therefore, increase profit); however, the amount of effort to design and implement, and the managing of the chaos actually made things worse. Many of the new managers did not even have the necessary skills or knowledge of their assigned technology or specialty. In 2011, the president of the company was summarily removed and another reorganization was announced (Bernhardt, 2012).

The 2009 reorganization distributed all the ACME South engineers amongst five different managers so that the responsibility for finding work would also be distributed; however, the split was arbitrary and some of these new managers were caught off-guard. Barry O was one such manager.

> But we also fight the greater organization. This idea of borderless engineering concept that was part of the 2009 reorganization does not work because you or I would rather walk down the hall to get the help we need rather than reach across a thousand miles to unfamiliar faces. The collaborative nature of our engineering and the distances between our engineers does not allow us to work together very well. Also, we are not good at managing work beyond our walls. (Barry O, Personal Interview, 2011).

> Distributed management is "no leadership." (Mel G, Personal Interview, 2011).

What Worked. Through all of these issues, there is evidence that some things are being turned around. Mark M's idea of moving larger chunks of work rather than piecemeal to ACME South seems to be the right means to keep the engineers engaged. There is also additional confidence that ACME South engineers are more capable than originally perceived. Mark M and Mel G had worked closely together to bring this about. As for the type of work that is presently done at ACME South:

> [They are doing] production support, logistics and fleet support, we gave them all the engineering interface work and various design projects. So they are now doing many pieces within the whole new program. We also have some project engineers working for us down there to manage and coordinate the work. There project engineers are not within my organization but report technical progress to me. (Mark M, Personal Interview, 2011).

ACME South as the center of production excellence continues to succeed. There are currently between five and seven major production programs added to ACME South since the privatization and more production transfer to the site is expected. Reverse Colonize is also a success with all at ACME as well as our Navy customer recognizing ACME South as the experts.

> The transition of production support worked very well. We were able to put a few people down there and we transitioned production support to them is stages and gave them more and more responsibility over time. The test support, production support, logistics is going okay. (Mark M, Personal Interview, 2011).

> [We have also taken over] production of some specialty systems [from ACME North]. We also bid for and won some Army work that is totally different from anything ACME South or ACME North has done before. It is high value with lots of units. It is being run directly out of ACME South.
>
> If we add any more manufacturing we will add more people. This is more than what anyone expected. There is no secret that the production side of

> ACME South is growing. According to all the things going on, we expect a lot more work. Frankly, I am not sure where we are going to put them all. (Mel G, Personal Interview, 2011).

> The Reverse Colonize team has a huge and stable workload. They do not have to manage the folks at the level that we do to scrounge up the work. They know they have work around the corner; [on the engineering side] we never know if there is any work for us in the future. (Mel G, Personal Interview, 2011).

The segregated tasks between the two business units and the unfruitful reorganizations have led to a further decline in teambuilding. I believe together the two business units would be a formidable force in the defense business.

> No one at the corporate level is driving this communication and team work. I saw a friend who works for a rival company and he told me that if ACME business units could work together ACME would be dangerous for the rest of us. We just don't know how to effectively work together. (Barry O, Personal Interview, 2011).

As for the type of future work for ACME South,

> Forget the small bits; send the whole program including management over there. I think they would do a very successful job. I think they are not given the opportunity to do this. We insist on keeping the management here. As long as we do not give them a large project for their own, we will have to continue to do piecemeal. They are never given the opportunity to have a real program. (Barry O, Personal Interview, 2011).

However, Mel G has his doubts that a complete program will ever be sent to ACME South.

> There may be one thing that is missing and that is project engineering skills to help manage the projects. I think we could do the project if one was sent to us. I don't think they will ever send anything like that to us. (Mel G, Personal Interview, 2011).

> Let me start by saying that earlier on, a decision was made to not provide heavy analytical type of engineering work here. Because that is a specialized skill. As far as the basic engineering skills, we have them. We have had engineers work here for a long time and know how to get things done. They just have not had the opportunity to do it. (Mel G, Personal Interview, 2011).

Sadly, Mark M and Mel G were neither recognized nor rewarded for all their hard work and achievements in changing the ACME South engineering group from a liability to a viable, responsible, and productive group.

Despite the chaos, ACME South has continued to re-invent itself. New leadership benefited from the low cost of ACME South work and the increased engineering utilization after the efforts of Mark M and Mel G. One other positive is the corporate recognition of ACME South as the center of production excellence. This is important because ACME South is now well placed to take over the design and development of the next generation products.

Many of the top managers that brought about these chaotic changes of 2009 are no longer with ACME. Most were fired or moved to corner offices never to be seen again. However, the impact of this change still resonates negatively in the system. New top management has come in and another round of reorganization is expected. The cycle continues.

CHAPTER 6: TWO PHORENETIC EMPOWERED PRACTITIONERS

> "*Phronesis* is what permits one to chase away false opinions and make good decisions." (Flyvbjerg, 2008, p. 110).

In this chapter, I will analyze the professional reputations of Mark M and Mel G. I will also evaluate the power in the system and apply Flyvbjerg's and Bourdieu's description of power to better understand the system. I will close this chapter with my personal reflection on the experiences of Mark M and Mel G.

Analysis of Power and Professional Reputations

Both Mark M and Mel G had demonstrated personal power and well developed professional reputations that allowed them to grasp the opportunities to improve the system. They risked their reputations by going against the grain; they encountered resistance, ridicule, and setbacks. Ultimately, when everything was beginning to go right, they were pulled from their responsibilities.

However, in the long run, these were minor sacrifices. Both broke through the established rules and processes their cohorts were under in order to find unique and viable solutions to the overall problems of under-utilization. Likewise, it is through reflective action they were able to implement their visions since there was no previous precedence to their actions. Unlike others in the system, they took on their responsibility to ACME South with conscience consideration for others, with a sense of duty. The experiences of hero engineers shows there are often opportunities to not only improve the systems and build personal expertise but to also provide caretaking of others within the system.

Power

I believe these hero engineers have special and additional *habitus,* understanding and ability to maneuver within the powers in the system. They almost seem to have their own "power pack" and compass. Recalling Bourdieu's (1984) theory on the logic of practice that each individual, or social agent, occupies a multidimensional social space, and the agent is not only defined by social class, but also by every single kind of *capital* he or she can accumulate through social relations. That capital includes the value of social networks, which Bourdieu showed, could be used to produce or reproduce inequity. Therefore, each agent engages in a specific complex of social relations in everyday practice or "field." The agent will develop a certain disposition, or *habitus*, for social action that is conditioned by position on the field (dominant/dominated, orthodox/heterodox, passive/aggressive, etc.). This *habitus* is then revealed through the agent's actions, thoughts, outlooks, and personalities (Bourdieu, 1990a). The *habitus* of these heroes was different from others in the system.

Recalling from Chapter 1 that accumulated capital can be leveraged to create power, I will now present my understanding of the power in the system as related to top management and our hero engineers. I will leverage Flyvbjerg's (2008) definition of power as presented in Chapter 1. He recommends asking the right set of questions to discover the power play in the system. Though the who, what, and where questions are important, a more revealing and *phronetic* point of departure would be questions such as:

1. What are the most immediate and most local power relations operating and how do they operate?
2. How are the power relations linked together, and according to what logic and strategy?
3. How do the rationalities support or oppose the power relations?

4. How can the games of power be played differently?

Since who, what and where is already presented in other chapters, I will provide my analysis of power for these *phronetic* the questions. It seems that the immediate and local power relationships were only superficially influenced by top management's attempt to consolidate power. Though personnel were not managed by remote, the work still needed completion. Mel G, without any direct responsibility, still continued his mentoring and influencing. Work still was being accomplished within the distributed management system but by local control.

The various powers in the system as linked in a complicated manner. In creating a distributed management system as a cost savings measure, top management lost their connection to local control. This void in leadership allowed engineers to seek out experts on their own rather than through the lines of management. This has led to a happy medium where top management does not interfere with the actions at the local level.

On the periphery, it seems that new management adversely effected interests of the hero engineers. However, knowing that both heroes survived and continued their paths regardless of their charters or their titles shows that the hero engineers may be temporarily impacted but not adversely affected. The two heroes took different paths after the 2009 reorganization to a distributed management system. Mark M went on to manage an even larger and more important project. Mel G continued his influencing, mentoring, and grooming of ACME South engineers even though that was no longer his assigned task or responsibility; no one has challenged him since there isn't anyone else doing the same in the system. Though management could take away their titles and assigned responsibilities, they did not control the hero engineers who continued to do their own thing. The new top management was remote and simply not aware of these or other possible heroes in the system and failed to leverage the available expertise.

New top management should have managed the system as status quo until they had a better understanding of the situation. Likewise, it was foolish not to seek out the advice of experts in the system. Flyvbjerg reminds us that:

> "Power is not something that is acquired, seized, or shared, something that one hold on to or allows to slip away. Power is exercised rather than possessed. Power is not an institution, and not a structure; neither is it a certain strength we are endowed with; it is the name that one attributes to a complex strategical situation in a particular society." (Flyvbjerg, 2008, p. 117).

This implies that power requires action or exercise; and therefore, more than just ideas and plans. The distributed management system was set up for the consolidation of top management power but this was executed without fully understanding our business. The hero engineers, though not at the same level of power as top management, seemed to have a better grasp of this concept by their actions towards improving the conditions between the two business units. Another link between power and action is praxis, the iterative process of reflection and action, as practiced by our hero engineers. Recalling from Chapter 1, Flyvbjerg (2008) argues that conscientiousness begets ethical behavior and an expert aims for ethical behavior though demonstrated conscientiousness and *phronesis* (applied wisdom). Our hero engineers are sensitive to the needs of ACME South engineers:

> In order to meet our commitments we needed to do a couple of things. We needed to keep people employed at ACME South. We needed to have solid work to improve employee morale, keep them entertained, and increase their knowledge of our products. (Mark M, Personal Interview, 2011).

> Yes, I have some engineers that need more attention. I have to keep on them to keep them focused. I provide them extra guidance in cases they are not as confident in their skills and capabilities. At the same time there are others that you give the task to and you do not have to worry about them. In any sort of large sample of people you will run into all sorts. (Mel G, Personal Interview, 2011).

> [I] learned from the older guys. We had big mil standard books for us to read and talk about with folks that were experts in them. Though the new computer tools are very helpful and help productivity, and we have access to a lot of information, it lacks the exchange of expertise between engineers and we have to seek that out individually.
>
> The mentoring and apprentice model is still valid today. A lot of the younger guys do not like to ask. They do not want to admit they do not know something. Some of us older guys may have forgotten that we should take to time to explain and keep track of how things are done and going. Learning through what the older generation has to offer is still a valid way to do things. (Mel G, Personal Interview, 2011).

Mark M took this situation as a moral challenge and rather than blaming others, he shows understanding.

> The problem is we have a lot more engineers down there than we need, and this has caused them to be less motivated since there is not a heavy workload on them. It does not help that we gave them small, piecemeal work. (Mark M, Personal Interview, 2011).

Though Mel G does not have any responsibility for ACME South engineers, he still continues to support them:

> They don't even report to me on the technical side since any more, they have their project leads from all over the country. I still am somewhat responsible to making sure they are busy, that everyone is getting attention. Not to get deeply involved with their detailed work but give them guidance and direction. Help coordinate with ACME North personnel. (Mel G, Personal Interview, 2011).

It is not my intent to focus on the folly of top management and the negative nature of power. I want to demonstrate the complexity of power and how it operates to create self-determining structures when there is a void in leadership. Also, power is a process that requires struggle and confrontations to transform, support, and improve the conditions in the system. To recall and summarize Flyvbjerg from Chapter 1, for a more comprehensive definition of power, we must add that power is more than a set of institutions and mechanisms that ensure servile

[workers]; more than a form of subordination which instead of violence, sets rules; and more than the general system of domination that one group exercise over another. This expanded view defines power in terms of force relations, which are not only unstable but also pliable (Flyvbjerg, 2008). This allows us to comprehend the complexity of the power in the system and identify leadership opportunities at the macro level that our hero engineers are able to recognize and leverage.

> Real Change in power requires changing ourselves, our bodies, our souls, and our ways of knowledge. It requires "work of the self upon the self." (Flyvbjerg, 2008, p. 122).

Overall, the behavior of the hero engineers seems to be based on their understanding of the plasticity of the system. Where most see a rigid, impermeable, and opaque system, they are able to identify where the system is flexible, open, and transparent; allowing them to act accordingly.

Professional Reputation

Both Mark M and Mel G are considered experts in their field of defense engineering when applying Flyvbjerg's human-learning process model. They demonstrated the ability to intuitively, holistically, and judiciously understand the situations, develop solutions, and take personal actions (Flyvbjerg, 2008). Mel G is recognized as an expert by Barry O:

> Mel G. has been the savior for ACME South in my opinion. He would have probably left or retired if he did not feel that he was needed and doing an important job of keeping things moving there. I think if Mel G was to leave, things would get bad pretty quickly and management would probably look towards making major changes that would affect many engineers at ACME South.
>
> People trust Mel G and turn to him to review their work and provide leadership. The interesting thing is that he is one of us (a former ACME North employee). There is a trust thing in that he [is] a competent engineer and knows how to do things right. Mel G also knows our standards and

> expectations that he can teach to others there. (Barry O, Personal Interview, 2011).

Both Mel G and Mark M also seem to have a good grasp of what it takes to be an "expert" engineer.

> Successful engineering is a learned process that is built up over time and cannot just come into existence just because we put some people together in a building. (Mark M, Personal Interview, 2011).

> I also think that engineering is not an 8 to 5 job. In order to be good at it, you have to constantly reach beyond your capabilities.

> The skills that younger folks seem to lack is to make sure they have really investigated all option rather than taking the first idea that comes up. You have to research it and do a trade solution rather than a point solution. Make sure you really look at things in detail. I am not looking for a quick answer; I am looking for the right answer. (Mel G, Personal Interview, 2011).

When analyzing using Goffman's (1961) professional reputation, both hero engineers underwent the experiences listed in Figure 4 (see Figure 4). I will examine each of these experiences:

1. Mark M also knew that he could not accomplish this by himself and recruited Mel G, who already had started bridging the gap between the two business units on his own. It was a smart move on both their parts to team up because it provided for a permanent liaison at ACME South who had a good reputation at both locations, and the experience of a seasoned engineer.

   > I went to ACME South to work [on an Army Programs project]. Was there for a year and a half for that task and when the time came for me to come back, I was approached by Mark M, program manager for [Catapult] to take a job with him and remain at ACME South. So I have been there ever since. (Mel G, Personal Interview, 2011).

2. They both experienced unjust deprivation by experiencing the humiliating loss of responsibilities and titles. Rather than recognition for their hard work, sacrifice, and accomplishments, they were demoted and marginalized.
3. Their work was complementary to others in the system because they were doing the work others could not do nor wanted to do.
4. Both were left with feelings of guilt and without fulfillment since they were not able to complete what they had started in motion. When recently asked to reflect on their experiences both had overcome their initial disappointments and said they had moved on. Both implied it was a temporary setback and that they had moved on to bigger and better things. Mark M saw it as a blessing since he would not have had the opportunity to bring in a new, large program to the company if he was still in charge of the ACME South engineering team. He joked that in his new capacity he can send them more work than ACME South could handle. Likewise, with Mel G as the lead manufacturing liaison at ACME South, he was able to identify various production programs that could be co-located to ACME South to further establish ACME South as the production center for ACME. Over time, both have landed on their feet and in a more advanced leadership position.
5. Their reflections on what has happened over the past few years during the interviews shows that despite the disappointments, they were glad for what they accomplished. Both have now moved on. After a few years of going back to his sole responsibility, Mark M is now also the lead engineering manager for a very large program. This is a brand new, high potential program that would require over 200 new engineers and long-term viability. Likewise, Mel G remains at ACME South and now manages all

production support at ACME South and continues to provide leadership to ACME South engineers. More and more products are now produced at ACME South.

6. Both experienced abandonment by their coworkers and managers. When the new organization was being proposed, AMCE North top management failed to protect Mark M and Mel G.
7. Due to the nature of their work, neither was able to hide much about themselves. In their interviews I found them to be authentic and what-you-see-is-what-you-get. Though they were "old-school," opinionated, and hard-driving they were highly respected and sought-out for advice.
8. For both, this experience was one progression in the "cycle of alienation and mortification" that has allowed them to learn from their experiences, re-create themselves, and to continue to seek out more opportunities for themselves and others. This is adding to their *phronesis* (practical wisdom).

According to Goffman (1961) professional reputation in is not a property of the person to whom it is attributed, but dwells rather in the pattern of social control that is exerted in connection with the person by himself and those around him. The social control is very evident in what Mel G said about his career at ACME; despite this setback, he stays his own course and continues to thrive. He has been in the business long enough to understand change is constant and sooner or later bad or counter-productive decisions are usually reversed.

> In my case the opportunities found me through my hard work; I do not go searching for the next big thing. I think if I did [my] job right, the opportunities will come. Rise to the top by doing my very best not just shuttling around form one job to the other for advancement reasons. (Mel G, Personal Interview, 2011).

Personal Reflection

I have a renewed admiration for Mark M and Mel G for their desires and actions to improve the system. They embody *phronesis* as defined by Flybjerg (2008), have the moral careers or professional reputations as defined by Goffman (1961), and have the honor and the dispositions that emphasize duty and execution of that duty as described by Bourdieu (1997). Though *phronesis* is not a generally recognized part of engineering, Mark M and Mel G have applied wisdom.

Mark M and Mel G were able to transcend their professional careers at ACME North and take on the challenges at ACME South. Many of the realizations identified by Goffman (1961) as pertaining to one's professional reputation were experienced by Mark M and Mel G. Both had solid professional reputations to begin with and quickly grasped the new reality of the ACME North and ACME South merger. They were better able to see the opportunities and act accordingly. These challenges added to their experiences and increased their professional reputations in the long run as indicated by their new roles and leadership positions with increased responsibility. Mark M and Mel G are examples where they have done the right things despite obstacles, disappointments, and humiliations.

One very important lesson that I take from this study is that leadership is ultimately about other people. Though engineering may be seeped in scientific thought and technical execution, it is a human endeavor fraught with issues often only resolved by *phronesis*.

CHAPTER 7: SUMMARY OF FINDINGS AND CONCLUSION

This research was to understand the relationship between two business units within ACME Corporation. However, this relationship turned out to be a perfect platform for investigating the *phronetic* actions by two hero engineers in the system. It also gave me an opportunity to document the history and the condition of the defense industry. Having done this research, I have a greater appreciation and understanding of the complexity of business relationships, leadership, and *phronesis*. I very much enjoyed conducting this case study and learned more about myself, other defense engineers, and the industry in which I work. I also discovered that experience is necessary in developing one's professional reputation, and that I have a ways to go, as I continue to develop my professional reputation and *phronesis* (practical wisdom).

The behavior of the unsung hero engineers allows us to recognize that engineering is a profound human endeavor and a social activity. Their primary focus was the care-taking, growth, and well-being of the people in the system. It almost seems that the heroes look at engineers as a protected species.

Findings

This is a typical defense industry story. There are no villains but many heroes in this case study. The two unsung hero engineers experienced the various pitfalls on their path to a professional reputation as described by Goffman (1961) and underwent the experiences provided in Figure 4 (see Figure 4). These experiences included unjust deprivations, uncompleted tasks, being let-down by others, feelings of isolation, and having one's fitness questioned and judged. These hardworking heroes got "kicked in the teeth", lost their prestige and were marginalized by management and the changing environment. During the much reorganization, they got lost in the

shuffle. In the long run, both were able to move on to better positions with more responsibilities – they persevered.

The two heroes were concerned about the people in the system and focused on a human, and not a technical, solution to resolve the conflicts between the two business units. This demonstrated leadership. Regardless of the changes in the organization and loss of their titles and responsibilities, they continued to do their work, their influencing, and their guiding. They remain unsung for their contributions to ACME South.

Implications for the Pentagon and Congress

The defense industry, as a complex government-business structure, begs for simplification and new management tactics. The main implication of this study for the Pentagon is that each defense program is unique in implementation and needs, and therefore requires management flexibility to successfully bring these programs to fruition. Present day cookie-cutter management methods and a generic acquisition process do not seem to work. As discussed in chapter 1, New Public Management, sometimes termed as New Government Management, tactics would benefit Pentagon and the defense industry in this decreased funding environment. This doctrine differs from the traditional military-bureaucratic ideas of 'good management' in that it requires professional, competent, and experienced management, elimination of duplication, and streamlining of bureaucracy.

For the Pentagon, the overall NPM doctrine calls for a more professional management team with explicit standards, measurable performance, and a greater emphasis on output control. Hood (1991) recommends systematically reducing incompatible objectives. The fewer the objectives, the easier it would be to identify and remove fat. One set of conflicting objectives for the defense industry is cheaper products and advanced technology. Likewise, Pentagon's

involvement in the process and the end-product is another conflicting set of objectives that would benefit from simplification. NPM, as shown in Table 2 (see Table 2), expresses that Sigma-type organizations benefit when they focus on the output rather than on process or input. This would imply more Pentagon programs should be structured with output in mind than overloading the industry with regulations that promote costly and non-value-added processes and methodologies.

Pentagon's aim to cut costs and do more-for-less can be achieved by implementing NPM-oriented, highly-competent management and a restructured organization. I am hoping that the ongoing cost cutting measures will drag the system towards such restructuring. Hood (1991) and Kaboolian (1998) also provide additional ideas for implementing NPM. These include:

- Decentralize by authority by splitting the organization into smaller more fragmented parts.
- Established measures of performance for Pentagon and the defense industry.
- Increase competition between different government agencies and private firms.
- Set incentives to outcomes and implement performance based contracting.
- Set policies from service/product delivery.
- Deregulate to allow more participation.
- Incentivize greater discipline and parsimony in resource use.

As mentioned in Chapter 1, Kaboolian (1998) argues that government agencies reflect politics - and therefore the health and improvement - of the current administration. For Congress and the Executive Branch, the focus should be to improve the system and effectiveness by implementing meaningful changes to the underlying politics that shifts the Pentagon's role towards a more customer orientation. Congress should also legislate for a balanced approach to defense industry capabilities and the Pentagon's needs for management and technical experts. The ideas of *phronesis* presented here should also apply to the Pentagon. Additionally, Congress

should recognize that the defense industry is not part of our free market system and to continue to apply a free-market lens, such as efficiency and low-cost, to evaluate and manage the system is futile.

Implications for Defense Companies

Defense companies have some similarities to a total institution. A defense company can be a total institution if top management makes unilateral decisions without regard to others or impacts to the long-term viability of the business. These "bone-headed" moves such as enforcing large numbers of policies and processes seems more to ratify management positions rather than corporate goals, meaningful control, and employee caretaking. In the long run, this can add bureaucracy, costs, and loss of talent that may limit future business.

A company's corporate *habitus* should be kept malleable in order to not only withstand the chaos in the defense business but to also allow for new structures into the systems that will be integrated into the corporate *habitus* over time.

Top management should do more to identify, recognize, and leverage their heroes. This is even more important when considering buyouts, mergers, and acquisitions. Rather than outright changing management personnel and management structures, it would be more prudent to investigate what is going well and identifying the heroes in the system prior to implementing changes.

Phronetic action should also be expected from top management and on down. This includes the consideration of possible outcomes prior to action. From my personal experience with various mergers and acquisitions, the more successful ones provided for a good blend in new and existing leadership to take the business forward. When re-organizing, be mindful of the various less tangible factors such as cultural and business conditions.

Management and technical employees should be encouraged to develop a "whole-mind" thinking that is in line with *phronesis*. This includes providing mentorship programs and opportunities to develop people skills through exposure to subjects such as ethics, art, psychology, awareness and other social sciences.

Implications for Defense Engineers and Potential Heroes

Defense engineers may have to develop a professional reputation, or moral career, in order to survive (and thrive) in the system. Simply, praxis (reflective action) and time spent at one's place of work will help in creating one's self that will contribute to one's professional reputation but one will have to progress through the Dreyfus and Dreyfus Human Learning Process Model, as presented in Table 3 (see Table 3). This implies that when coming into a new system, one will have to start as a novice and progress towards an "expert" by accumulating experiences and developing additional capabilities.

Defense engineers should also anticipate hardship and "humiliations" which, in the long run, contributes to their better knowing the system and learning their craft. Defense engineers should expect to go through the following moral career experiences (also see Figure 4) as they develop their professional reputation.

1. One needs to reach out for the help of others in getting work done and that this shared work is for mutual benefits.
2. Some work may be considered "unjust deprivation." This is the mundane, non-value added, time wasting, and personally humiliating work.
3. One's role should be complementary to others on the team.
4. One may not be able to complete all and this may lead to feelings of guilt.
5. One's recognized-self rises through the view one constructs when looking backwards over one's progress (creation of the peculiarly retroactive character).

6. One may be deserted, abandoned, or sacrificed by one's coworkers (the idea of letting go of bad or divergent personal bonds and creating new bonds as one moves on).

7. One cannot hide too much about oneself from others in the system and that one's work history is often revealed to others when successful outcomes are re-used and one's advice is sought, or on the other side, when others have to clean up one's past mistakes and marginal work. Plus, there is talk and gossip in the system.

8. Cycles of alienation and mortification (humiliation) allow for new sets of beliefs and opportunities to reconceive a self.

Both our heroes did not see themselves as heroes; this may be a qualifying factor. Both did what they thought as right and not for the desire to be heroes or to be recognized as heroes. This possibly implies that if you aim to be a hero for the recognition and adulation, you will more likely miss your mark.

It is also very likely that most heroes are not recognized. Though our two heroes were able to bounce back, there is also no guarantee that all heroes bounce back. Finally, defense engineers should balance their technical capabilities with social science knowledge to help develop *phronesis*. This case study has taught me that heroes:

- Demonstrate leadership. They feel responsibility towards others. Though other may call this moral action, I'm not sure they see any difference between acting morally and their everyday actions.
- Have a unique *habitus* (characteristics) that allows them to see the plasticity of the system.
- Are experts and apply *phronesis*. This allows them to intuitively navigate the system.
- Have built sufficient social, cultural and symbolic capital to make things happen.
- Have experienced hardship and setbacks.
- Work hard and are tenacious.

- Practice humbleness and are life-long learners.
- Don’t see themselves as heroes.

Further Research

The scope of this case study was limited to the *phronetic* behavior of two hero engineers with the relationship between the two business units as the background. I would like to incorporate the experiences of other ACME business units and find other hero engineers in the system. This method of qualitative inquiry could then be used to identify future leaders. I am also interested in extending this study to other corporations. Here are some possible areas for further study:

1. The hero engineers provide an alternate leadership to management. I would like to investigate if this is a unique finding at ACME or that unsung heroes are common to other fields.
2. Having found that the defense industry is not part of our free market, I am interested in identifying other sectors of our economy that are also closed-market systems. It would be interesting to discover what percentage of our GDP is from these industries.
3. I would also like to broaden the study of professional reputation to better understanding individuals who rise above the rest and are able to see the opportunities to enfranchise others. These folks seem to have a unique drive and purpose that is worthy of study.

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